

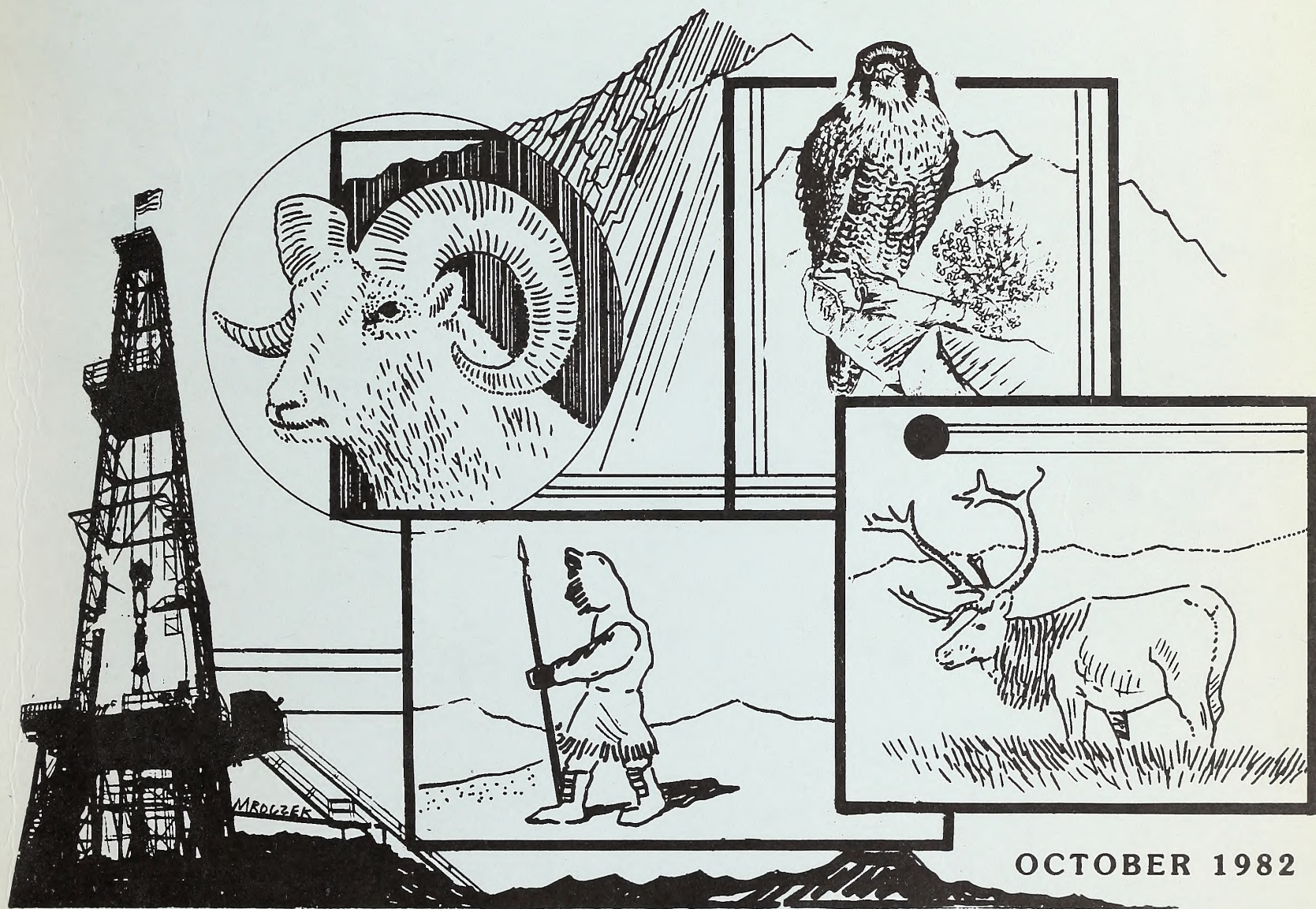
DRAFT ENVIRONMENTAL IMPACT STATEMENT

ON

OIL AND GAS LEASING AND DEVELOPMENT

IN

THE NATIONAL PETROLEUM RESERVE IN ALASKA



U.S. Department of the Interior
Bureau of Land Management

Alaska State Office
701 C Street Box 13
Anchorage, Alaska 99513



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Errata

Page

Corrections

24 The first sentence of this page should read:

Use of terrestrial habitats by polar bears within NPR-A is limited to coastal regions from October through April when females seek denning habitat.

108 The first full sentence on this page should read:

This information provided a basis for estimating how change among the Inupiat may be telegraphed to the Inuit culture throughout the Arctic.

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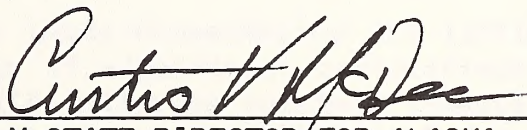
DRAFT
ENVIRONMENTAL IMPACT STATEMENT
ON
OIL AND GAS LEASING AND DEVELOPMENT
IN THE
NATIONAL PETROLEUM RESERVE IN ALASKA

OCTOBER 1982



PREPARED BY
BUREAU OF LAND MANAGEMENT

NPR-A PROGRAM STAFF
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ANCHORAGE, ALASKA


BLM STATE DIRECTOR, FOR ALASKA

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BUREAU OF LAND MANAGEMENT

Alaska State Office
701 C Street, Box 13
Anchorage, Alaska 99513

OCT 01 1982

Dear Reader:

This Draft Environmental Impact Statement (DEIS) is an analysis covering future oil and gas leasing on the National Petroleum Reserve of Alaska (NPR-A). It is a culmination of legislation, studies, analyses, and coordination with the public beginning in 1976. Benchmarks in this process include passage of PL 94-258 Naval Petroleum Reserves Production Act, in 1976 which placed the Reserve under the administration of the Department of the Interior, and the passage of the Interior Department 1981 Fiscal Year Appropriations Act, which mandated an expeditious program of oil and gas leasing and development.

In the intervening six years the extensive Federal exploratory drilling program, surface values inventories, field studies, and the environmental analysis prepared for the first two oil and gas lease sales have contributed a solid basis for this DEIS which is a summation of the process. The accumulated experiences resulting from construction of Prudhoe Bay, the Trans Alaska Pipeline System (TAPS), and the NPR-A Federal drilling program have created a group of people from industry, government, and the general public, who are aware of the actual environmental issues rather than theoretical ones.

The DEIS focuses on those issues and values which were the most likely to be impacted by petroleum development. Another objective was to make all discussions relative, and to provide a quantitative basis for comparisons when possible. In a quantitative analysis, losses and gains are represented numerically or proportionately to facilitate the comparison of benefits and costs. This comparison of gains and losses was used to develop a preferred EIS alternative, which balances critical environmental values with petroleum values.

Insights into NPR-A's oil and gas potential were gained from the latest interpretation of geophysical data by Tetra Tech, and the Minerals Management Service (MMS). Industry interest expressed through the BLM nomination process and the results of the first two NPR-A sales, also contributed to BLM's understanding of the oil and gas values of NPR-A.

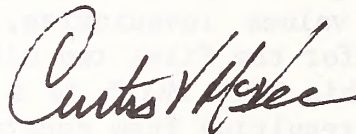
Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA) requires that Federal Agencies hold hearings if significant restrictions on subsistence uses would occur. Since the DEIS indicates possible impacts on caribou and subsistence, a hearing dealing with these effect on subsistence within the NPR-A is tentatively scheduled for November 23, 1982 at Barrow, Alaska which is acceptable to the Arctic Regional Subsistence Council. Notice of the hearing, stating the exact time, place, and location will be publicized on the Barrow radio station, public television, and through general circulation newspapers.

The public comment period for the DEIS ends on December 10, 1982. Public meetings to accept comments on the DEIS will be held in the North Slope Borough, Anchorage, and Fairbanks, during November. The Final EIS is scheduled for release February 1, 1983. A Record of Decision scheduled for April 1, 1983, will identify areas that the BLM State Director for Alaska will offer for oil and gas leasing. This Record of Decision will confirm which EIS alternative management strategies will be applied.

Any comments on the EIS should be sent to:

Bureau of Land Management
Alaska State Office
NPR-A (916)
701 C Street, Box 13
Anchorage, Alaska 99513
ATTENTION: Mr. Jerry C. Wickstrom
NPR-A Program Manager
Telephone (907) 271-3632.

Sincerely yours,



Curtis V. McVee
Bureau of Land Management
State Director for Alaska

Executive Summary

1. Type of Action: A Proposed Oil and Gas Leasing Program, for the National Petroleum Reserve in Alaska (NPR-A) is required under PL 96-514, the 1981 Department of the Interior Appropriations Act. The nature of this action is administrative rather than legislative.
2. Description of the Action: This DEIS considers all of NPR-A for inclusion in future oil and gas lease sales exclusive of acreage leased in previously authorized sales (P.L. 96-514) in January and May of 1982. This DEIS analysis concentrates on lands of perceived high potential for oil and gas development and key issues derived from an EIS scoping process that preceded this DEIS (McVee, 1982). There is an 83 percent probability that commercially recoverable amounts of oil and gas would be discovered in the proposed lease tracts identified in NPR-A.
3. The Decision Process: The BLM has implemented this DEIS as a framework for making better decisions as required by the Council on Environmental Quality. In this DEIS, the Bureau of Land Management (BLM) deliberately has chosen to be concise. The use of brevity is intended to concentrate the public attention on helping BLM identify the management alternative that best balances the congressional objective of expeditious NPR-A leasing against the need to maintain a healthy environment. However, the pitfall of brevity is that some readers legitimately may wonder whether all significant issues can be treated in a DEIS of less than 120 pages. The BLM chose conciseness over detail in this DEIS because of the quantity and quality of information on NPR-A already produced and absorbed by the public during the past six years of NPR-A studies and programs. The efficacy of this approach to an EIS that focuses concisely on the issues and options which this agency and the public must confront will be proved when the public juries the results.

Consistent with the purpose of this decisionmaking framework, the BLM placed major emphasis in the DEIS on those resources most at risk of being affected by NPR-A leasing. They are identified using these four risk factors: likelihood of exposure to oil and gas operations or facilities; sensitivity of the resource to industrial activities; vulnerability of the resource (for example, a species that congregates seasonally in a restricted environment); and the nature of mitigation (can mitigation be assured or is effective mitigation difficult to design or hard to implement).

Based on these risk factors and information gathered through extensive public meetings, the DEIS concluded that the following species and issues required further analysis.

Key Species and Issues Analyzed in DEIS on the NPR-A

<u>Key Species</u>	<u>Major Issues</u>
◦ Caribou	In addition to key species, these issues surfaced as significant for EIS analysis:
◦ Grizzly Bear	◦ Subsistence lifestyle of North Slope
◦ Polar Bear	◦ Borough
◦ Geese	◦ Fisheries as subsistence resource
◦ White-fronted Goose	◦ Recreation use that would accompany
◦ Black Brant	opening roads to NPR-A oilfields
◦ Peregrine Falcon	
◦ Other Raptors	

The BLM managers working on the DEIS compared and contrasted alternatives which would mitigate impacts to key species. The DEIS points out that to mitigate means to make the outcome or result of an event (such as oil and gas development) less severe, intense or painful. Here are the proposed management strategies to accomplish this:

Management Strategies to Mitigate Impacts on Key Species and Issues

Avoidance Alternatives

- ° No surface occupancy restrictions
- ° Deletion of areas from leasing

Design Solution

- ° Restriction on: facility location, facility design, and facility use

Public Law 96-514, the 1981 Department of Interior Appropriations Act, requires that "the reasonably foreseeable and significantly adverse effects" of NPR-A development be mitigated. However, the public may believe that while all alternatives mitigate to some extent, only some management strategies represent an acceptable level of mitigation. This DEIS provides an opportunity for the public to inform BLM of what is acceptable.

BLM's Proposed Preferred Alternative

- ° Removes from leasing consideration
 - the central calving area of the western Arctic Herd of caribou
 - the area of highest density black brant molting
- ° Defers from leasing
 - southwest corner of NPR-A until at least 1992
 - two townships of Fish Creek for waterfowl studies.
- ° Includes design solution leasing and use of standard requirement leasing
 - throughout the balance of NPR-A where there are key biological resources at risk.

Result: If implemented, there would be leasing and possible development within all areas not deleted or deferred. These developments would have some level of impacts that BLM may be unable to mitigate. The BLM believes that the only way to totally eliminate impacts is not to lease anywhere in NPR-A. The no leasing option would frustrate the other legitimate objective set forth in Public Law 96-514 which is to commence "an expeditious program of oil and gas leasing and development" in the Reserve.

4. Preferred Alternative and Predicted Impacts for Key Species and Issues.

Although BLM as a steward of the public land would like to say that there would be no impacts from its decisions, it clearly would be unable to support such an indefensible conclusion. Impacts under the preferred alternative are discussed below.

Caribou: None of the literature, including this DEIS, has precisely predicted the response of caribou to intrusion of unknown levels of human developments in undetermined locations that would occur in a previously unaltered range. Since there has never been a major industrial development within the caribou range of northwestern Alaska, a series of hypothetical development models was formulated for this DEIS as a basis for impact prediction. These predictions may or may not accurately reflect actual future patterns of any NPR-A petroleum

developments. Nevertheless, both qualitative and quantitative impact predictions based on these models have been made. They met EIS requirements for wildlife impact predictions and provide information for use in lease tract evaluation.

The Preferred Alternative may lead to a reduction in the size of the NPR-A caribou herds and may result in alterations in seasonal distribution of caribou.

Should further leasing in NPR-A lead to oil and gas development(s), the result would decrease to some degree NPR-A's carrying capacity for caribou.

Grizzly bear: Further leasing resulting in development(s) south of a line drawn from Point Lay to Umiat may result in some direct decrease in NPR-A's carrying capacity for grizzly bears.

Polar bear: Further leasing in NPR-A north of a line drawn from Peard Bay to Nuiqsut that leads to oil and gas development may lead to some decrease in NPR-A's carrying capacity for onshore winter maternity denning by pregnant females. Destruction of some bears in the interest of public safety is also likely.

Geese: With the limited surface occupancy protection of the coastal environment and deletion of the Teshekpuk Lake Goose Molting Area, development elsewhere in NPR-A would not result in any significant loss of carrying capacity for geese or other waterbirds.

Peregrine falcon and Other Cliff-nesting raptors: The nesting success of the endangered peregrine falcon on NPR-A would decrease in direct proportion to any increase in human disturbance near nest sites.

5. Irrevocable Resource Commitments: The human and financial resources that would be dedicated to oil and gas development would be lost to use for other productive sectors of the economy. Similarly, energy expended in exploration, construction and field operation also would be opportunities lost to use for whatever else might have been produced with that energy. On the other hand, should commercial production result, the financial resources committed to NPR-A oil development would be considerable.

About one-third of the gravel used in NPR-A development would not be reclaimable. Vegetation damaged or covered during facility construction could be replaced by exotic species during the rehabilitation phase which precedes site abandonment; however, the rehabilitation would not be restoration to original site conditions. The native plants that were destroyed should be viewed as irrevocably lost.

COASTAL ZONE MANAGEMENT ACT

NPR-A nearshore waters meet the definition of coastal waters in the context of the Coastal Zone Management Act of 1972 (CZMA), as amended. The shoreline of NPR-A meets the CZMA definition of coastal lands. When considering a decision which might directly affect the coastal lands and waters within the coastal zone, the BLM must do so:

...in a manner which is, to the maximum extent practicable,
consistent with approved state management programs
(16 USC 1456)...

The preferred alternative discussed in the DEIS was designed to protect resources of the coastal zone through a combination of avoidance alternatives and design solutions. Avoidance alternatives include the deletion of sensitive habitats from consideration for leasing and/or the application of no surface occupancy restrictions to sensitive habitats. Design solutions include the establishment of requirements for regulating the operation or location of facilities and for mandating lessee studies of the ecological relationship between key species and their habitats. These studies would form the basis for seasonal restrictions and for requiring the redesign of operations or facilities to minimize the effects of oil and gas activities on the coastal environment.

The BLM has concluded that the preferred alternative is, to the maximum extent practicable, consistent with the State of Alaska coastal zone management program. We hope that the State of Alaska, Division of Policy Development and Planning (DPDP) will use the review period for the DEIS as an initial forum for either (a) concurring in BLM's conclusion or (b) identifying concerns or issues regarding coastal leasing which the preferred alternative did not, in the State's view, adequately address.

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Nine	Listing of BLM Standard Requirements For NPR-A Leasing (Standard Lease Stipulations)

C H A P T E R O N E

PURPOSE FOR ACTION AND LIMITATIONS ON AGENCY DISCRETION

I. INTRODUCTION

The National Petroleum Reserve in Alaska (NPR-A) is a 37,000-square-mile (96,000-square-kilometer) area of Federal land lying between the Brooks Range and Arctic Ocean on the North Slope of Alaska (Figure 1). Potential impacts of activities that could result from oil and gas leasing in NPR-A are predicted in this Draft Environmental Impact Statement (DEIS). The DEIS also identifies and discusses the best alternative means for both encouraging oil and gas development and protecting the surface resources of NPR-A. It is intended to support a balancing of the nation's need for energy and the need to maintain and enhance the quality of the human and natural environments. A premise of this DEIS is that a quality environment includes natural areas preserved and managed for the benefit, enjoyment and education of the people. This DEIS discusses alternative ways to promote oil and gas activities that will have a net beneficial effect on the quality of life. It also considers the historic uses of public lands by rural Alaskans and attempts to minimize disruption of those uses.

The BLM's objective is for this to be the only DEIS for leasing in the Reserve. Specific projects such as pipelines, roads, and field developments will require further specific National Environmental Policy Act (NEPA) analysis of potential impacts if the approval of such projects would constitute a major Federal action.

The leasing program analyzed in this DEIS is, in one sense, the beginning of exploration for, and possible development of, the oil and gas resources which may be within the Reserve. In another sense, it is continuation and culmination of a long process which studied alternative uses of Federal lands in NPR-A and made recommendations concerning the best use or uses of the area. These preceding studies and decisions shown in Table I-1 are, in part, the basis for this DEIS.

II. PURPOSE FOR ACTION

With the passage of the Department of the Interior Appropriations Act of 1981, Public Law 96-514, the U.S. Congress assigned the job of promptly beginning and operating a competitive oil and gas leasing program on the NPR-A to the Bureau of Land Management (BLM). In the case of NPR-A oil gas leasing, "the leasing program" is to offer 12 million acres for lease at annual sales held from 1983 through 1987. This would be an average of 2 million acres per year, although the actual acreage offered could vary from year to year; further, the leasing program is to hold additional sales beyond 1987 in response to oil discoveries or heightened interest in the Reserve.

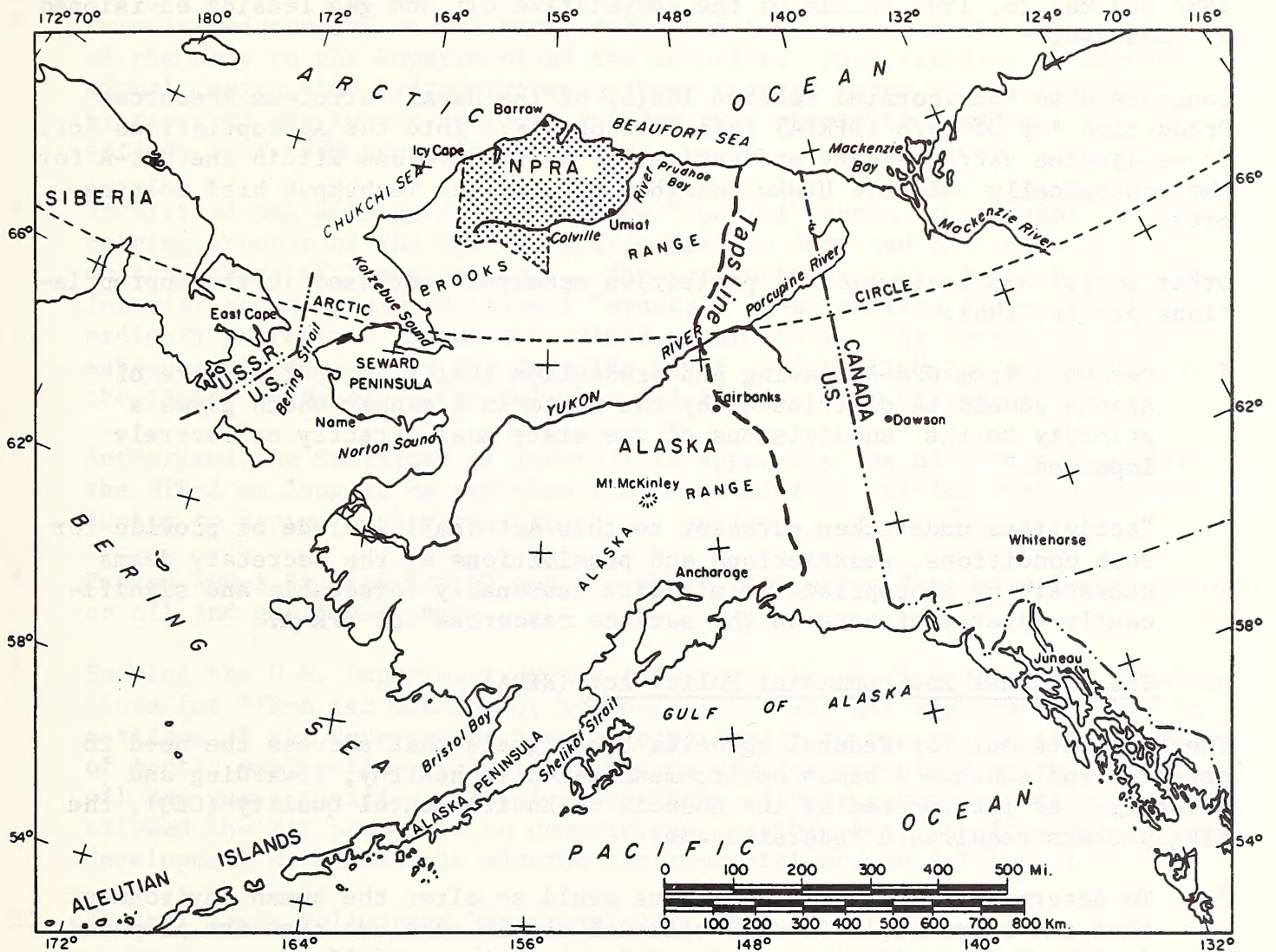
Undertaking a leasing program requires compliance with all applicable laws and guidance. The following summary of such laws and guidance applicable to NPR-A leasing also reflects the management ethic and decision making processes followed by the BLM as stewards of the public land.

T A B L E I-1
Overview of Events Leading to EIS

<u>ERA</u>	<u>EVENT(S)</u>	<u>BRIEF DESCRIPTION</u>
1923	NPR-A Designated	President Harding recognizing the oil and gas potential on the North Slope and economic and environmental difficulty of its development, set aside an area as a strategic reserve to be administered by the Navy.
1944 - 1953	Early Naval Exploration	Drilling on this program called "Pet-4" began in 1944 and ended in 1953. It resulted in 45 shallow core-test wells and 36 test wells, including four near Barrow. The Navy also acquired nearly 3,400 line miles of seismic reflection data, nearly 400 seismic refraction profiles, gravity data from more than 6,000 stations, and 12,600 flight line miles of aeromagnetic data.
1972 - 1977	Late Naval Exploration	The Navy's second NPR-4 exploration program began in 1972 and from 1974 to June 1977 completed seven test wells outside the Barrow area, nearly 7,700 line miles of seismic surveys, and gravity surveys at more than 30,000 stations.
1976	Passage of the Naval Petroleum Reserves Production Act	In April 1976, jurisdiction of the Reserve was transferred to the Secretary of Interior by Public Law 94-258 and its name became the National Petroleum Reserve in Alaska. Exploration was assigned to the U.S. Geological Survey (USGS) on June 1, 1977.
1977 - 1980	105 (b) and (c) Study Program	The 105(b) and (c) studies were compiled by specialists from a variety of disciplines to analyze existing and potential uses of the NPR-A; to identify key species that play a role in maintaining the Arctic ecosystem(s), to determine their response to human activity; and to make recommendations for future management.
1977 - 1981	USGS Exploration	<p>The USGS continued to explore and evaluate NPR-A petroleum resources, develop and produce gas from the South Barrow gas field, and rehabilitate areas disturbed by previous exploration efforts. For future management, the USGS defined ten exploration plays based on geologic and geophysical characteristics and established a program to test each with at least two wells. As new data accumulated, the ten original plays were subdivided into 17 areas of perceived high oil and gas potential.</p> <p>The USGS completed 21 widely scattered test wells (for a total of 28 in the program); about 5,700 line miles of seismic surveys; gravity surveys at more than 27,000 stations, and limited aeromagnetic surveys. Discovery well Walakpa 1, showed gas, and Walakpa 2 confirmed that the gas field extends at least 4 miles (6 km) from the discovery well. Good gas and oil shows were observed at several test wells.</p>
1980	Department of Interior Appropriations Act	Congress mandated an expeditious program of oil and gas leasing of 2 million by August 1982 and development in NPR-A.
1981	Final Environmental Assessment NPR-A Oil and Gas Leasing	Identified lands to offer at the first two NPR-A lease sales.
1981	Final Regulations Adopted	Regulations to authorize leasing and manage oil and gas activities in the Reserve are adopted (43 CFR 3130).
1982	First Two Lease Sales Held	Lease sales held in January and May of 1982 in Fairbanks, Alaska resulted in the leasing of 37 tracts (about one million acres).

FIGURE 1

LOCATION OF NPR-A



SOURCE: TETRA TECH, 1982

A. The Department of the Interior Appropriations Act of 1981

The Appropriations Act waived requirements of the National Environmental Policy Act (NEPA) for as many as two sales so long as not more than two million acres were sold. The BLM used the Environmental Assessment (EA) process to select areas best suited for these initial sales. The decisions made during this environmental assessment process are contained in the National Petroleum Reserve in Alaska Final Environmental Assessment Federal Oil and Gas Lease Sale of September 1981 (U.S. Department of Interior). Lease sales held January 27, 1982 and May 26, 1982 initiated the competitive oil and gas leasing envisioned by Congress.

Congress also incorporated Section 104(b) of the Naval Petroleum Resources Production Act of 1976 (NPRPA) (see Section I.F.) into the Appropriations Act. It designates extraordinary protection for surface values within the NPR-A for the ecologically valuable Utukok caribou calving and Teshekpuk bird molting areas.

Other social and environmental protective measures addressed in the Appropriations Act are that:

- ° Revenues from NPR-A leasing and production that flow to the State of Alaska should be distributed by the State in a manner which gives a priority to the "subdivisions of the state most directly or severely impacted."
- ° "Activities undertaken pursuant to this Act shall include or provide for such conditions, restrictions and prohibitions as the Secretary deems necessary or appropriate to mitigate reasonably foreseeable and significantly adverse effects on the surface resources" of NPR-A.

B. The National Environmental Policy Act (NEPA)

The NEPA sets out for Federal agencies broad goals that address the need to preserve and enhance a human environment which is healthy, rewarding and enduring. As interpreted by the Council on Environmental Quality (CEQ), the NEPA process requires a Federal agency:

- ° To determine whether its decisions would so alter the human environment that the responsible Federal official should conclude that the proposed decision(s) constitutes a major Federal action; and if so,
- ° To initiate and prepare an Environmental Impact Statement (EIS).

To assist in this determination, CEQ developed a means of analyzing EIS issues and decisions through a management tool called scoping which:

- ° Identifies highly regarded values such as rare plants or animals, scarce recreation opportunities, unique ecosystems and unusual features and/or other issues which are of great concern to the public;
- ° Involves the public in developing alternatives which both would allow the valuable new uses of the public land (in this case oil and gas development) and protect the highly regarded values, features, and areas to assure, as

required by the Federal Lands Policy and Management Act (FLPMA) that "permanent productivity of the land" be maintained;

- ° Provides information to the decisionmaker in the Federal agency to help "sort" issues which require in-depth EIS analysis from those that do not.

C. The Naval Petroleum Reserve Production Act of 1976 (NPRPA)

This Act is central to leasing in the NPR-A because it:

- ° Transferred control of the Naval Petroleum Reserves from the Department of the Navy to the Department of the Interior. This signaled a Congressional desire that hydrocarbons on these Federal lands no longer should be reserved for future national defense but should be available to satisfy near term economic objectives.
- ° Identified two ecologically sensitive "special" areas, the Utukok Uplands calving grounds of the Western Arctic Caribou Herd and the waterfowl molting areas of Teshekpuk Lake. The Act authorized the Secretary of the Interior to designate additional "special" areas calling for extraordinary protection of surface values within them. The Secretary subsequently designated the Colville River as "special" for protection of the raptor nests along the Colville and for its wild character.
- ° Authorized the Secretary of Interior to approve plans of operation within the NPR-A so long as he provides the Department of Justice with an opportunity to review such plans (antitrust review).
- ° Funded NPR-A Studies 105(b) and (c) which provided a data base for decisions on oil and gas development.
- ° Enabled the U.S. Department of the Interior: to develop operating regulations for NPR-A (43 CFR 3360); to conduct oil and gas exploration work in portions of the Reserve; to have an opportunity to experience the complexity of Arctic exploration activities; and to develop stipulations regulating oil and gas activities. These projections of hydrocarbon potential allowed the EIS preparers to compare the possible benefits from oil development with possible adverse environmental and social impacts.

D. Federal Lands Policy and Management Act (FLPMA)

The Federal Lands Policy and Management Act (FLPMA) passed in 1976 firmly established the principle of multiple use management of public lands. The multiple use principles contained in FLPMA instruct BLM:

to manage... the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people... a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and non-renewable resources, including but not limited to recreation, range, timber, minerals, watershed, wildlife and fish, and natural, scenic, scientific and historical values... harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the environment with consideration being given to the relative values of the resources

and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

FLPMA has been determined to be generally applicable to NPR-A. Section 202 (Planning) and 603 (Wilderness) of FLPMA were waived by Congress in the Appropriations Act. By deleting Section 202, Congress allowed leasing without the completion of a comprehensive land use plan. By deleting Section 603, Congress allowed leasing without reference to ongoing BLM studies identifying lands for Wilderness status.

E. The Alaska National Interest Lands Conservation Act (ANILCA)

This Act passed in December 1980 provides Congressional mandates for managing the Federal lands in Alaska. Key provisions affecting NPR-A are:

- ° Section 604 in which the Colville, Etivluk-Nigu, and Utukok Rivers are identified as wild and scenic study rivers. Based on an opinion of the Solicitor of the Department of the Interior, these rivers are withdrawn from oil and gas leasing until September, of 1984, to provide Congress with adequate time to determine whether they should be permanently designated as wild and scenic.
- ° Section 810 assigns the responsibility for providing a preference to subsistence households in the allocation of wildlife during shortages to the State of Alaska Department of Fish and Game (ADF&G). Each Federal land managing agency, including the BLM, is charged with preserving maximum feasible subsistence harvesting on public lands consistent with other valuable land uses and sound biological principles. As required by ANILCA, the ADF&G established six Alaska subsistence resource regions encompassing all public lands in Alaska. Local residents who sit on these six Regional Advisory Councils will be involved in helping BLM identify strategies for protecting and enhancing subsistence while allowing for other valuable uses of the land, such as oil and gas production. BLM will use the NEPA (EIS/EA) process to identify any impacts on subsistence resulting from BLM decisions altering land uses and will involve the appropriate Regional Council in discussions on ways to reduce or avoid subsistence impacts.
- ° Under Section 905, individual Alaska Natives are entitled to a 160 acre allotment if they filed for the allotment prior to December 18, 1971.
- ° Under Section 1431(0), the Arctic Slope Regional Corporation may select subsurface mineral rights under village lands within NPR-A. This option could not be exercised until lands within 75 miles of the village(s) had been opened for commercial development. NPR-A leasing based on the first two sales satisfied this requirement for lands within 75 miles of Wainwright, Atkasuk and Nuiqsut. ASRC has until January 26, 1987 to exercise this option for Atkasuk, Wainwright and Nuiqsut. This exchange right may affect the location and timing of BLM's leasing program in NPR-A. To avoid needless confusion over who will ultimately lease village lands, the BLM is not considering those lands for the initial five year leasing program.

- ° Section 303 (1) of ANILCA established the Alaska Maritime National Wildlife Refuge. This section states that "public lands on islands, islets, rocks, reefs, spires and designated capes and headlands in the Chukchi Sea" shall be part of the above mentioned refuge. ANILCA further stated in Section 304 (b) that, with respect to these refuges (including the Alaska Maritime National Wildlife Refuge) "the Secretary (of Interior) may not permit any use...unless such use (including but not limited to any oil and gas leasing...) is compatible with the purposes of the refuge."

A final determination as to whether NPR-A islands, inlets, capes and headlands in the Chukchi Sea are in the refuge has not been made. BLM will not offer for lease any islands, islets, rocks, reefs, spires and designated capes and headlands in the Chukchi Sea within NPR-A until such time as the Department of Interior determines whether these lands are in the Maritime Refuge. If these lands are on a refuge then leasing would only proceed after the compatibility test has been applied.

F. BLM Decision Process

BLM management decisions for the NPR-A are made on several levels within the agency to accomplish BLM objectives and follow legal guidelines. As previously stated, primary authority for leasing decisions rests with the BLM State Director for Alaska. Decisions regarding on the ground activities (seismic lines, facility siting, etc.) are delegated to the Fairbanks District Manager and the Arctic Resource Area Manager.

BLM decision making also involves the public, State, Federal and local government agencies, BLM professional staff, and technical information from knowledgeable researchers. BLM's decision process began for NPR-A in 1976 when the Reserve was transferred by the Congress from the Department of the Navy to the Department of the Interior by the NPRPA. After Congress authorized NPR-A leasing in the Appropriations Act of 1981, an Environmental Assessment (EA) was prepared by the BLM Alaska State Office for the State Director. Coordination with the public, North Slope Borough, State of Alaska, and the Minerals Management Service (MMS) continued throughout the EA preparation. Based on the EA, the BLM State Director for Alaska selected lease tracts, developed lease stipulations, resolved policy issues and implemented the first two competitive lease sales.

Issues and values tentatively identified by the EA as meriting EIS analysis were later confirmed during the Scoping Process.

Consistent with CEQ Guidance that the DEIS should focus on resources and uses which are at risk of being significantly impacted, BLM has refined scoping into a valuable decision tool with broad benefits in multiple use planning. BLM's use of scoping as a focusing tool is discussed below.

The BLM's scoping process was completed in May 1982 (McVee, 1982). As the EIS preparers began to analyze the public comments received during scoping, they concluded that it might be possible to identify key factors about NPR-A surface resources which would allow for the classification of those values in terms of risk of impact. Key classification factors as shown in Table I-2 are exposure to development, sensitivity to human activity, vulnerability and whether mitigation is problematic. NPR-A surface resources were converted to "types"

in the classification system using these factors and binary logic. Table I-2 explains these factors in greater detail, while Table I-3 shows how binary logic can be used to convert NPR-A surface resources to "types."

T A B L E I-2
Risk Factor Discussion

Key Classification
Risk Factors

Discussion

Exposure to
Development

If a species is in an area (uses a habitat) which is of perceived high oil and gas potential then the species is more likely to be exposed. If a species is in an area with almost no oil and gas potential then the species is unlikely to be exposed. Species which use lands which would represent major engineering problems (steep slopes and eroding shore lines) may not be exposed even if these lands are within areas of high perceived oil and gas potential. Some individuals within a broadly distributed species (for example, wolverine) may be occasionally exposed to and even displaced by oil development. However as exposure is weighed at the species (or subspecies or race) level, broadly distributed species are not considered likely to be exposed in a meaningful sense. BLM can influence the degree to which a species may be exposed to oil development, through no surface occupancy stipulations. Species using barrier islands and the NPR-A coastline can be protected by no surface occupancy restrictions. BLM will preclude occupancy on these areas (see Chapter Three, shorebirds). These species are, therefore, considered as unlikely to be exposed to development.

Sensitivity to Human
Activity

On the basis of prior studies certain species, especially caribou during calving and geese during molting, are highly sensitive to man's activities even when those activities do not pose a direct threat to the species. This sensitivity can adversely affect species productivity by altering normal feeding or resting behavior or by leading to energy depleting avoidance responses.

Vulnerability to
Development

Certain species; especially caribou during calving, bears and wolves during maternal denning, geese during molting and peregrine falcon and other raptors during nesting, are highly vulnerable to disruption because they tend to congregate in or share the use of a restricted habitat.

Problematic Nature
of Mitigation

If protection of a species from impacts cannot be assured due to lack of information on how to design and enforce effective protection then mitigation remains problematic.

T A B L E I-3
Classification System For Determining Risk of Impact

<u>Resource</u>	<u>Exposure</u>	<u>Sensitivity</u>	<u>Vulnerability</u>	<u>Problematic Mitigation</u>	<u>Raw Score</u>	<u>"Type"*</u>
Caribou	1.0	1.0	1.0	1.0	4.0	One
Grizzly Bear	1.0	1.0	1.0	1.0	4.0	One
Peregrine falcon	1.0	1.0	1.0	1.0	4.0	One
Other raptors	1.0	1.0	1.0	1.0	4.0	One
Polar Bear	1.0	1.0	1.0	1.0	4.0	One
Geese	1.0	1.0	1.0	1.0	4.0	One
Fish	0.0	1.0	1.0	0.0	2.0	Two
Wolves	0.0	0.0	1.0	1.0	2.0	Two
Dall Sheep	0.0	1.0	0.0	1.0	2.0	Two
Shorebirds	0.0	0.0	1.0	1.0	2.0	Two
Ducks	0.0	0.0	1.0	1.0	2.0	Two
Whistling Swans	0.0	1.0	0.0	1.0	2.0	Two
Wolverine	0.0	0.0	0.0	1.0	1.0	Two
Fox	0.0	0.0	0.0	1.0	1.0	Two

* Binary logic represents a condition with a one (1) and the absence of that condition with a zero (0). Species scoring higher than 3.0 were considered Type One. Type One resources were recommended to the Alaska State Director, Bureau of Land Management, for comprehensive EIS analysis (Chapter Four of the DEIS); Type Two resources were recommended for a moderate level of analytical treatment (Chapter Three).

The sensitivity and vulnerability factors were previously used by the State of Alaska in an analysis of the impacts of Beaufort Sea development (Table I-4). BLM use of these factors does not, therefore, represent a new analytical approach.

The reader may justifiably wonder why BLM is including in the DEIS species which the EIS preparers have concluded would (a) only be exposed to oil development in insignificant numbers (b) or only encounter oil development on the periphery of their habitat(s). (These values have zeros under the exposure factor in Table I-3.) The reason these values are included is that they are of great concern to the public as evidenced by scoping comments. A synthesis of Public comments received during scoping is in Chapter Six. The DEIS is the only forum BLM has to tell scoping commentators of its conclusions on exposure. In addition if BLM is wrong and a species which was thought to be unlikely to be exposed does, in fact, experience oil development then the DEIS will have identified mitigations which could reduce impacts to that resource.

The EIS analytical effort continues the process of public, government and agency input focusing on priority concerns that emerged during the scoping process. By May 1, 1983, the BLM State Director for Alaska will make major decisions regarding the future administration and management of the NPR-A including: whether to lease; when and where to lease; and how best to manage development to assure reasonable protection of existing surface values and uses.

T A B L E I-4
(Source Adapted From State of Alaska, 1982)

Sensitivity/Vulnerability Index For Various Avian Species and Habitats in Barrier Island-Lagoon Areas Along the Eastern Beaufort Sea Coast of Alaska (Based on 1977, 1978, and 1979 data and the literature)+

H A B I T A T					
Species	Gravel	Barrier Islands		Lagoon	
		Oceanside Shorelines	Lagoonside Shorelines	Shallow Lagoon	Deep Lagoon
Oldsquaw			loafing** (25 July-30 Aug)	Loaf-feed* (25 July-30 Aug)	feeding*** (open water season)
Brant	nesting** (1 June-30 July)				migration** (20 Aug-5 Sept)
Eiders	nesting*** (1 June-30 July)			loaf-feed* (1-30 Aug)	
Phalarope		during high density staging*** (10-30 Aug)	during high density staging** (10-30 Aug)		during high density staging* (10-30 Aug)
Glaucous Gull	nesting* (1 June-30 July)	during staging* (15-30 Sept)	feeding/ staging* (30 Aug-30 Sept)	feeding* (25 July-30 Aug)	
Arctic Tern	nesting*** (1 June-30 July)		feeding/ staging* (15-30 Aug)	feeding* (15-30 Aug)	

* Sensitive/vulnerable. ** Very sensitive/very vulnerable.

*** Critically sensitive/critically vulnerable.

+ The term "sensitive" is applied to barrier island-lagoon habitats that may be easily affected by development-related activities (primarily oil and gas development activities) and the term "vulnerable" to species of birds (in some cases whole populations) that may be especially susceptible to development-related activities.

To illustrate this decision process, the EIS preparers divided the NPR-A lands which have moderate to high perceived oil potential into 500 discussion tracts. These tracts divide the NPR-A regions of high perceived/high potential into site specific units that will enable the BLM and the public to pinpoint their concerns about where and when to lease; whether to lease and how to manage development. These 500 discussion tracts are shown on Plate One located in the back of this DEIS.

A secondary purpose served by the illustrative discussion tracts is to indicate how the leasing process works. Lands are delineated into tracts, tracts are scheduled for sale, the sale is held, industry may or may not bid, and tracts are leased where acceptable bids are received.

These discussion tracts are shown solely to illustrate how the leasing process works, and to facilitate the exchange of information by pinpointing geographical locations. Discoveries within NPR-A, or new interpretations, of geophysical data may indicate that it is in the nation's interest to lease outside these tracts.

Surface management decisions that follow leasing are the responsibility of the BLM Fairbanks District Office. The MMS and BLM share responsibility for petroleum exploration and development operations. The BLM District Manager in making decisions concerning surface resources will cooperate closely with MMS in consultation with the State of Alaska and the North Slope Borough on drilling, facility siting, roads, and pipelines.

III. OVERVIEW OF ALTERNATIVE LEASING STRATEGIES

During the scoping process (McVee, 1982), the BLM State Director for Alaska selected these six alternatives for EIS analysis: standard requirement leasing, selective deletions, no surface occupancy leasing, design solution leasing, seasonal restriction leasing and deferral leasing. Subsequent to the State Director's scoping decision, no surface occupancy became a BLM standard practice agency wide. Therefore, no surface occupancy restrictions in NPR-A will be discussed under the Standard Requirements alternative below.

A. Standard Requirements Leasing

The first alternative, standard requirements leasing, would involve offering all tracts for lease while requiring only those practices which:

1. Are customary and usual and adopted or developed voluntarily by industry or routinely applied by a regulatory body;
2. Have been previously adopted by BLM for NPR-A lands; and/or
3. Are routinely employed throughout BLM.

Standards previously developed by BLM for onshore and offshore Alaska oil development and conditions considered standard by BLM on an agency-wide basis are listed in Plate Nine located in back of this DEIS.

The Standard Requirements Alternative represents an analytical base case where development could occur anywhere within NPR-A and the "state-of-the-art" environmental protections would govern development. Areas of no surface occupancy restrictions are discussed in Chapter Three and Four of this DEIS.

B. Deletion

BLM deletes lands when the environmental losses from development of these sensitive areas appear to outweigh the perceived oil and gas benefits. However, deletion is not synonymous with withdrawal. Deletion could lead to withdrawal if a future analysis indicates that the loss of surface values would always exceed the oil and gas benefits.

Some deleted lands may eventually be found to be suitable for leasing and other multiple uses (unsuitable for withdrawal). Before these lands could be offered for lease, the BLM would:

- ° Inform the public that lands previously considered for withdrawal are being considered for leasing;
- ° Summarize for the public the impact discussion from this EIS;
- ° Select appropriate stipulations; and
- ° Respond to public comments and concerns.

C. Design Solution Leasing

Under this alternative, oil and gas operations that take place in a sensitive environment would be designed or managed to reduce such factors as the numbers of personnel in the sensitive environment, the frequency and duration of human activity within or above the sensitive environment, and the distribution of company facilities and operations.

D. Seasonal Restriction Leasing

This would have all lands offered for lease, but during certain critical times of the year all oil and gas related operations would be substantially reduced or eliminated.

E. Deferral Leasing

This would involve rescheduling the 1987 sale to 1992 or beyond, while awaiting new developments which might include discoveries of new fields elsewhere in NPR-A or in the Arctic. These new fields may resolve the question of whether western NPR-A oil would go west to the coast or east to TAPS thus providing information on whether NPR-A would or would not be bisected by pipelines. Information on whether geese and caribou were habituating to development associated with these other new fields would also clarify questions about the magnitude of impacts resulting from developments in sensitive NPR-A habitats.

C H A P T E R T W O
AFFECTED RESOURCES AND USES

I. INTRODUCTION

CEQ guidance (40 CFR 1510) states that the "environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration." This seemingly simple charge is extremely complex when applied to NPR-A oil and gas leasing decisions for the following reasons.

- ° NPRA is not a single environment but rather a mosaic of environments; and,
- ° Specific areas to be affected or created can not be identified until applications for drilling permits are received.

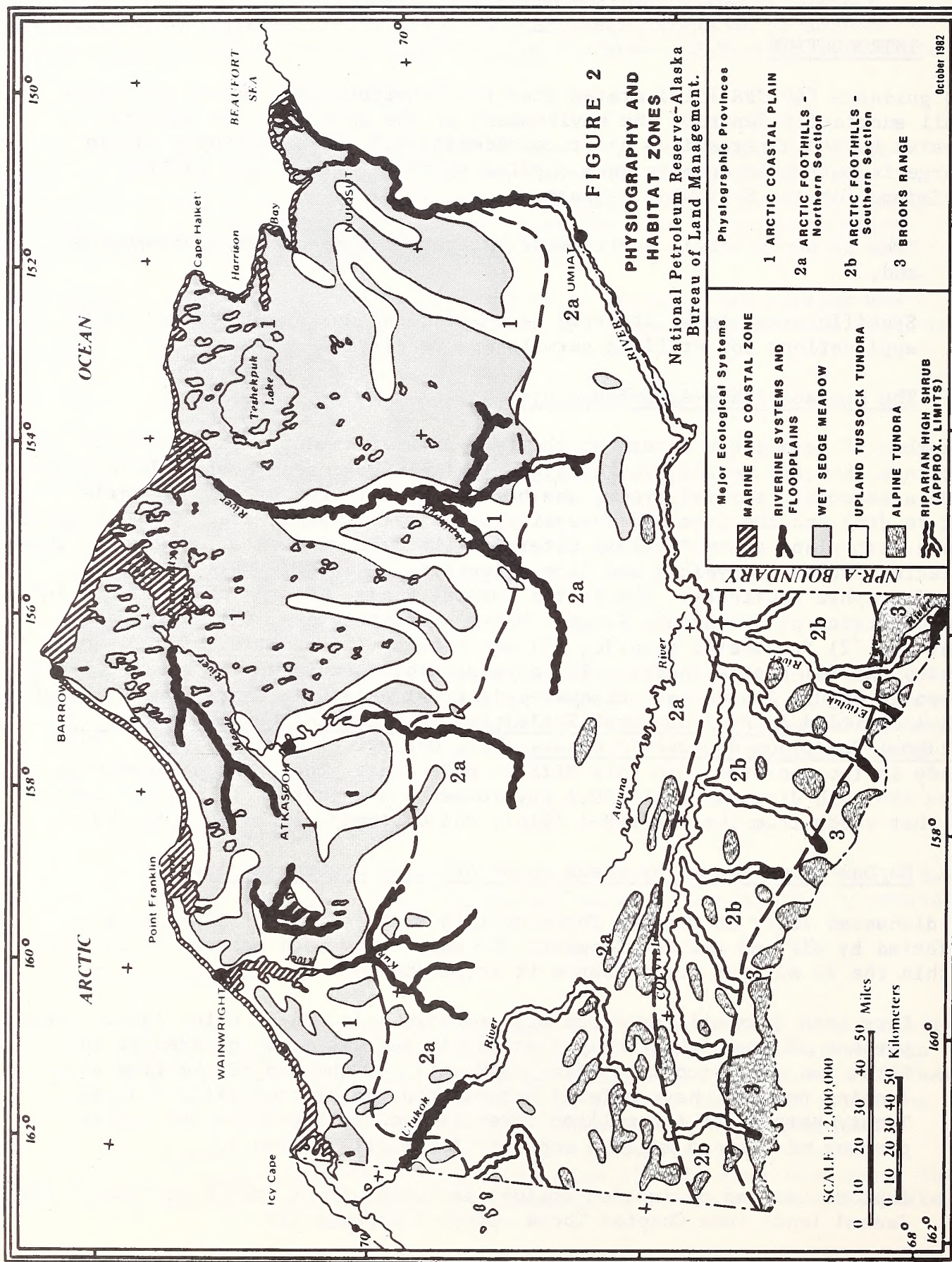
A. The Mosaic of NPR-A Environments

A number of parameters determine the type of environment. These include the latitude (how far north), the altitude (height above sea level), the distance from a seacoast, soil(s) types, whether the area is wet or dry (or varies from wet to dry) and the type and intensity of animal or human use. Such parameters, along with plant community(ies) determine the type of habitat. Based on these selected factors, physical and life scientists classified NPRA into three physiographic provinces: the Arctic Coastal Plain, an area of foothills and the mountains of the Brooks Range. NPR-A's habitats are: (1) marine and coastal, (2) freshwater aquatic, (3) wet tundra, (4) riparian, (5) tussock tundra and (6) alpine tundra. The physiographic provinces and habitat zones shown in Figure 2 have been discussed in great detail in a previous study of NPR-A entitled An Environmental Evaluation of Potential Development on the National Petroleum Reserve in Alaska (U.S. Geological Survey, 1979). This study is incorporated into this DEIS by reference. Those readers desiring a more thorough discussion of NPR-A environments are invited to request copies of that study from the BLM/NPR-A (916), 701 C Street, Anchorage, AK 99513.

B. No One Knows Where The Areas to be Affected or Created Are

As discussed later in Chapter Three of this DEIS not all of NPR-A will be affected by oil and gas development. No matter how much acreage is offered within the 23 million acre Reserve it is predicted that:

- ° Less than four million acres will receive bids and be sold, (about twenty percent of the high perceived value oil and gas lands offered at the first two sales received bids. BLM will, by the end of the five year leasing program, have offered between ten and sixteen million acres. Twenty percent of ten million acres is two million acres and twenty percent of sixteen million acres is 3.2 million acres.);
- ° Exploration and production activities would affect only a portion of the leased lands (see Chapter Three, pages 1 through 12).



C. DEIS Focus on Noteworthy Species and Uses

Since NPR-A is a mosaic of environments and no one can predict where the affected environments will be, BLM decided to primarily focus on sensitive species which because of their migration patterns or use of areas of high perceived oil and gas potential would likely be exposed to oil and gas activities. The process used to classify species on the basis of sensitivity and exposure is discussed in Chapter One, page 7. Plate Two located in the back of this DEIS shows areas of high perceived oil potential. Species using these areas are more likely to be exposed to development.

The balance of Chapter II discusses the distribution of the noteworthy biological resources, the subsistence lifestyle which those surface resources support, and recreational opportunities which exist because of these NPR-A surface resources. In addition, three environmental quality (EQ) issues which may be affected in any environment are discussed. These EQ concerns are (1) soils and erosion, (2) air quality and (3) water use and quality. (Section V below.)

II. BIOLOGICAL RESOURCES

Information on the distribution of sensitive biological resources which merit DEIS treatment (see Chapter One, page 7) is presented on a species by species basis in this section.

A. Caribou

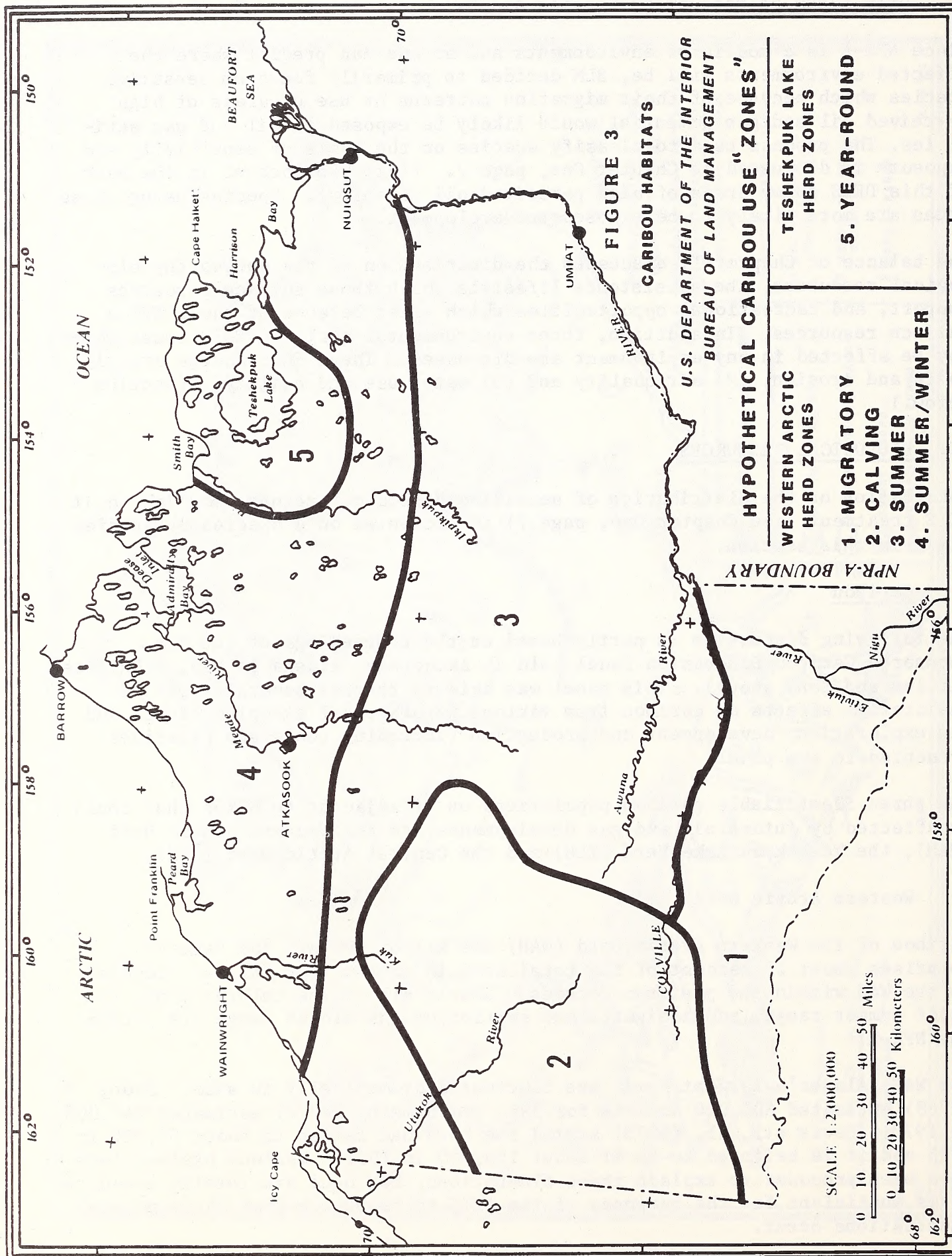
The following discussion is partly based on the proceedings of the BLM sponsored Caribou Discussion Panel held in Anchorage, Alaska in May, 1982 (see Gilliam and Lent above). This panel was able to forecast several types of qualitative effects on caribou from various hypothetical examples of oil and gas exploration, development and production (including roads and pipelines) presented to the panel.

The three identifiable caribou populations on or adjacent to NPR-A that could be affected by future oil and gas developments are the Western Arctic Herd (WAH), the Teshekpuk Lake Herd (TLH) and the Central Arctic Herd (CAH).

1. Western Arctic Herd

Caribou of the Western Arctic Herd (WAH) use all of NPR-A. The Reserve comprises about 25 percent of the total area in northwestern Alaska occupied by the WAH within the past two decades. Nearly all of the calving zone, the major summer range, and a significant portion of the winter range lie within the NPR-A.

The WAH, Alaska's largest herd, has fluctuated dramatically in size. Skoog (1968) estimated 300,000 animals for 1964 and Hemming (1972) estimated 242,000 in 1970. Davis et., al. (1978) stated the herd had fallen to about 65,000 in 1976 and it is believed to be at about 180,000 in 1982. Various explanations have been proposed to explain these fluctuations, but none are totally adequate. It is sufficient for the purposes of the DEIS to recognize that these natural fluctuations occur.



Because all of the Reserve is used by the WAH in some years, designation of specific areas with precise boundaries for caribou is neither feasible nor particularly useful when trying to predict caribou use patterns for each year's cycle. However, to assess the significance of effects stemming from oil and gas development on the WAH, NPR-A can be divided into hypothetical zones according to the nature and timing of major caribou use during most years. As can be seen in Figure 3 the migratory use zone lies in the southernmost part of NPR-A. This zone is used primarily by caribou moving in large groups along either an east-west or north-south axis, depending on the year and season. Pre-calving movements in spring may entail large numbers of caribou moving east-to-west through the zone or entering from the southern passes and moving westward.

Ninety percent or more of WAH calves are born from about May 24 to June 12. The calving zone designation is an attempt to map where the concentration of calving has been greatest during the two decades of observation. The calving zone shown will contain the greatest concentration of calving in most years, although in some years calving may occur outside this zone.

Following calving in the first week of July, most of the WAH is moving in large groups in a west-to-east pattern along both sides of the crest of the De Long Mountains in the migratory use zone. About the second week of July, the caribou swing north into the summer use zone where they drift into small groups and remain until Fall.

By August or September, caribou cross the Colville River and move through this zone in a north-to-south pattern to return to the Noatak winter range. Other uses of the Colville drainage include a scattering of overwintering caribou, grazing by males and yearlings during the calving period, and summer range.

The coastal zone (zone of both summer and winter use) may contain 50 percent or more of the WAH during July and August. Distinct dispersed movement of animals to and from coastal areas occur. Caribou are widely dispersed into small groups within this zone. When large numbers of caribou winter on the coast, the zone is important for pre-calving migration which proceeds mainly in a south or south-westerly orientation along generally undefined corridors. Winter use may occur in most years.

Usually more than 10 percent of the WAH winters north of approximately 70° latitude. Summer occupancy of this zone is low, but occasionally large dense concentrations of caribou seeking relief from insects are spotted along the coast.

While differing habitats are used seasonally, as indicated in the discussion of zones above, it is known that caribou utilize all of NPR-A. Dr. Peter C. Lent, (USGS, 1979) a noted caribou expert, states:

...the large, highly mobile caribou populations of the Arctic regions must not be considered able to withstand impacts of development because of the vast land mass they occupy. On the contrary, they are able to obtain high numbers only by long energy-consuming movements to and from specific areas that provide optimum conditions at specific times. These areas vary from year to year. The pathways of movement represent highly vulnerable "life-lines" essential for their well-being. The situation is analogous to and has the potential for proceeding in a similar fashion as

Beaufort Sea

LONELY

Smith Bay

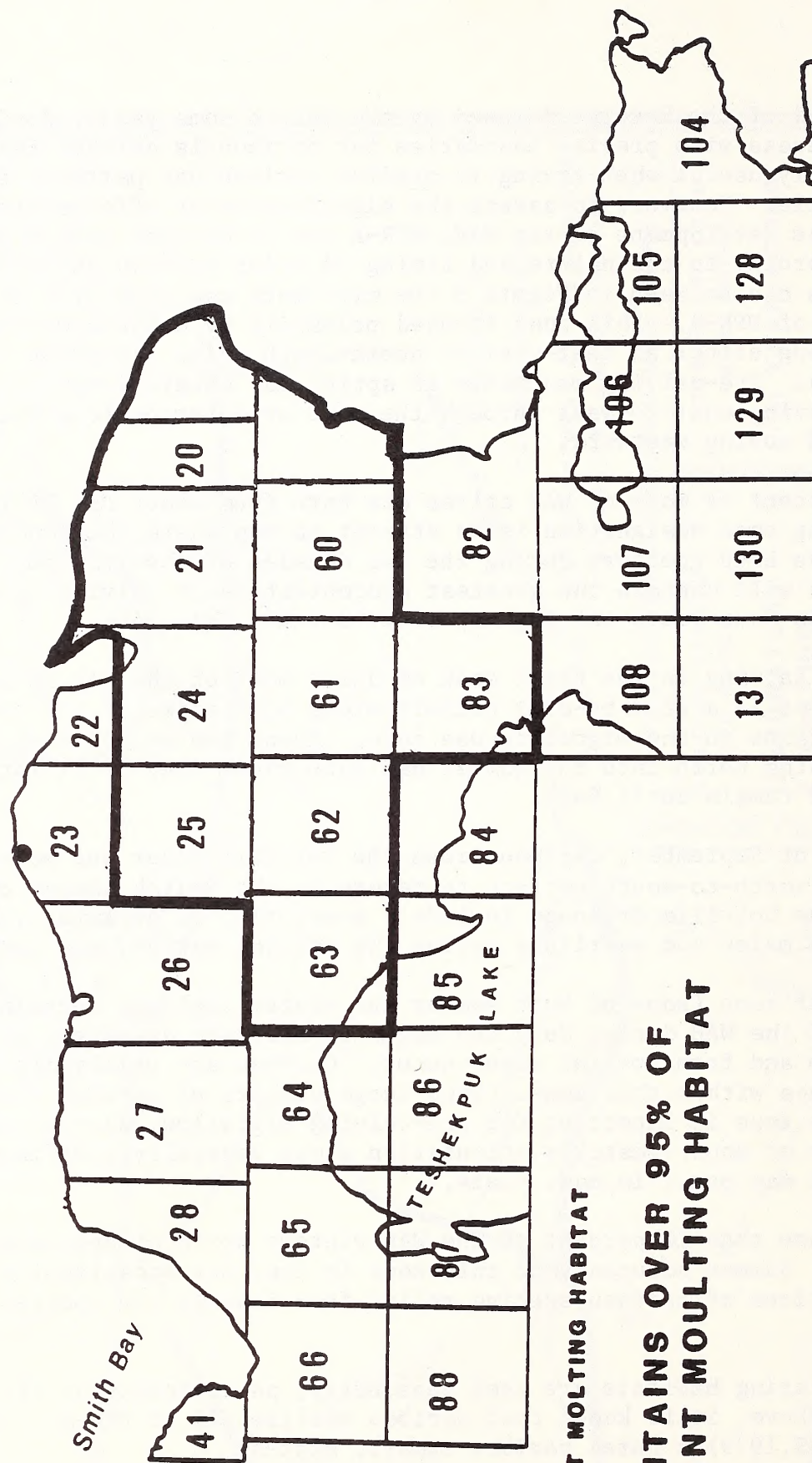


FIGURE 4 BRANT MOLTING HABITAT

**CONTAINS OVER 95% OF
BRANT MOULTING HABITAT**

the situation with the large, mobile mammals of the African savanna. In many areas development and restrictions to movements have resulted in fragmented small, sedentary populations, which, lacking free access to areas previously used to satisfy annual requirements, have become less productive, subject to stress mortality, and unstable.

This statement documents the necessity for caribou access to all of NPR-A in order to maintain and increase their present population.

2. Teshekpuk Lake Herd

This herd of 4,000 to 5,000 caribou area remains relatively distinct from the Western Arctic Herd. Short seasonal movements maintain the herd year-round in an area around Teshekpuk Lake extending southward into the northern Foothills. (See Figure 3, zone of year-round occupancy.)

This group's range seems to be more confined than that of the comparable Central Arctic Herd whose history and trends are also poorly understood. Indications are that a similar group of caribou with comparable movement patterns was present in the same area 40 to 50 years ago.

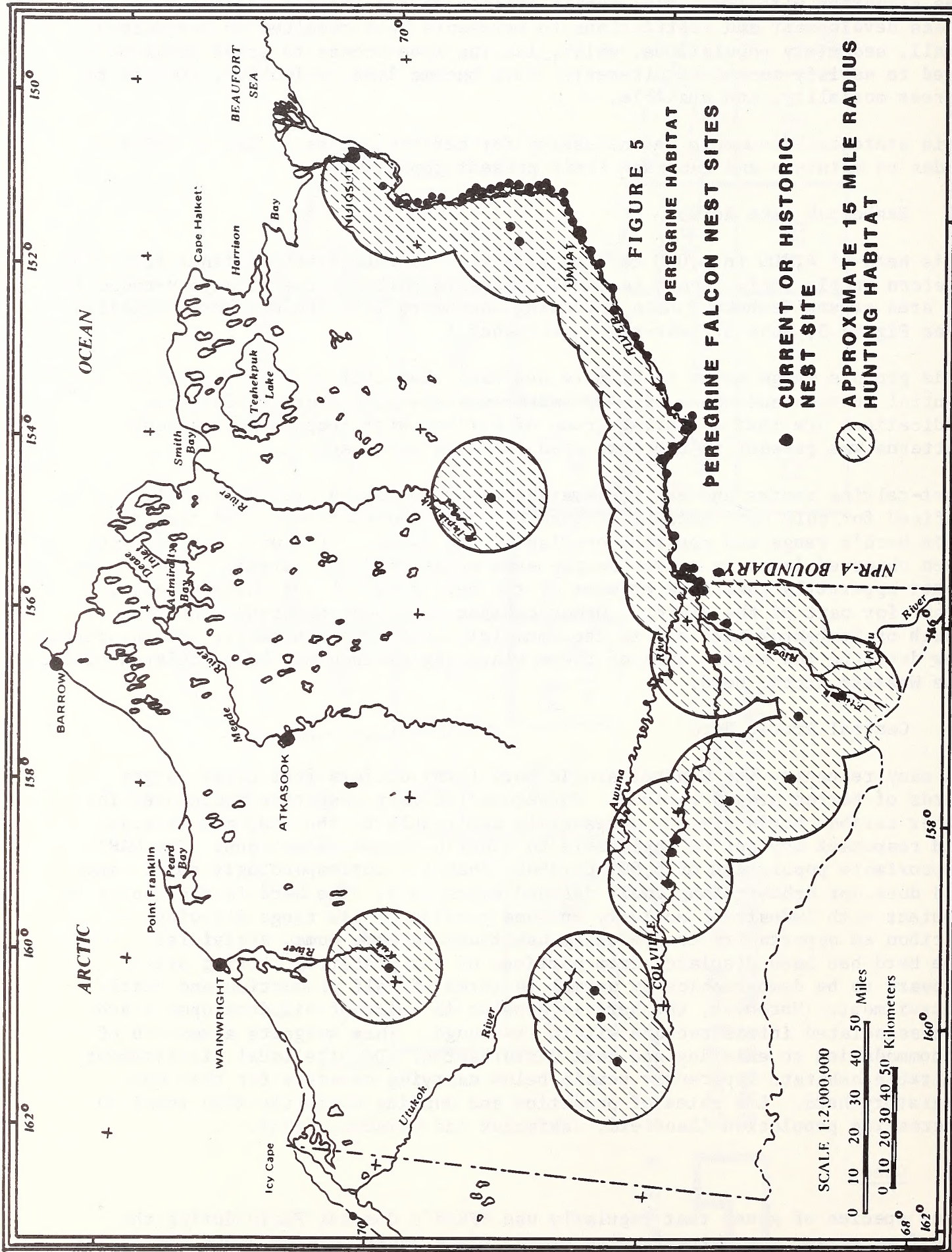
Post-calving routes and early summering areas presently are not now clearly defined for this herd because of lack of study and the compressed nature of this herd's range and apparent overlap of use zones. Cows with calves have been observed later in summer on the same areas used for calving. Fall movements apparently take some or most of the herd south of the Chipp River, at least for part of the winter. Other caribou have been observed wintering north of Teshekpuk Lake and to the immediate south and southwest, but apparently few drift to the east. Some of these wintering caribou may be associated with the Western Arctic Herd.

3. Central Arctic Herd

In many respects, the Central Arctic Herd (CAH) differs from other larger herds of barren ground caribou. Consequently, many responses documented for other caribou herds are not necessarily applicable to the CAH, and observed CAH responses may not be applicable to other herds or situations. The CAH's approximate population of 6,000 caribou inhabit a correspondingly small range and does not exhibit long, well defined migrations. The herd is constantly in contact with industrial activity on some portion of its range allowing the caribou an opportunity to gradually habituate to some human activities. While the herd has been displaced from portions of its preferred calving areas, it appears to be demographically normal in terms of calf production and yearly recruitment. Moreover, the herd is growing in spite of oil development and the associated infrastructure within its range. This suggests a measure of accommodation to existing and past disturbances. Despite local displacement, suitable habitats apparently remain below carrying capacity for this non-migratory herd. Low rates of predation and hunting mortality also favor an increasing population (Banfield, Jakimchuk and Cameron, 1981).

B. Geese

Four species of geese that regularly use NPR-A's Coastal Plain during the ice-free season are white-fronted geese, black brant, Canada geese and lesser



snow geese. Other geese rarely sighted in NPR-A include Ross' geese and snow geese. Highest densities of geese are usually found within 20 miles inland from the coast. Geese concentrated on the Teshekpuk Lake goose molting area in July and salt marshes in late summer.

The discussion of black brant and white-fronted geese is partly based on the proceedings of the BLM sponsored Waterbird Discussion Panel held in Anchorage, Alaska in May 1982. This panel analyzed the relationships between hypothetical petroleum exploration, development and production actions and their predicted effects on geese and other waterbirds present on NPR-A each summer. A record of the panel proceedings (Gilliam and Lent, 1982) is available from BLM/ASO (941), 701 C Street, Box 13, Anchorage, Alaska 99513.

1. Black Brant

Estimates have been made that up to 20 percent of the total world population of black brant molt to the north and east of Teshekpuk Lake in the Teshekpuk Lake goose molting area. The entire nonbreeding segment of brant from nesting areas north of the Bering Straits in Canada, Alaska and Siberia molt here. This annual occurrence demonstrates the importance of the lake to their life cycle. Figure 4 shows the area of highest density brant molting. Over 95 percent of brant molting habitat is contained within or immediately east of nine EIS discussion tracts. Brant use the deep open lakes within these tracts for molting. The only colony nesting goose on NPR-A, Black brant colonies are small with the largest at Island Lake consisting of 100 pairs.

Black brant follow the same spring migration and fall migration pathways along Alaska's west coast. The lagoon and barrier island system at Icy Cape and Peard Bay provide food and nesting areas for the migratory brant. This coastal migrant moves south-westward along the Arctic Coastal Plain toward Yukon River Delta, Izembek Lagoon, and south-eastward along the Pacific Ocean coast to wintering areas in Baja California.

Black brant are very sensitive to human disturbance especially during molting. Their survival is enhanced when they occupy areas of low predator and human disturbance.

2. White-fronted geese

White-fronted geese are the most numerous and widely distributed goose on NPR-A. This species accounted for 59 to 97 percent of all geese observed from late June to mid-September during 1977 and from 71 to 94 percent of observations made from July to September 1978. Average population levels for 1977 and 1978 were 53,900 and 47,800 respectively. White-fronted geese generally enter the Reserve from the east in May dispersing to suitable habitat on the Coastal Plain. Their departure from the Reserve is by scattered routes to the east that leads to the main central flyways.

White-fronted geese are more broadly distributed over NPR-A than are black brant. For example, only about 5,000 molting white-fronts are typically in the Teshekpuk Lake Goose Molting Area (TLGMA).

During the molt, flock size of white-fronted geese is relatively small compared to other NPR-A species of geese. Flocks do not shift to coastal areas following

completion of the wing molt. White-fronted geese are known to segregate themselves from other flocks during molting periods and feed on different foods in different microhabitats.

White-fronted geese are the most common breeding geese on NPR-A, but are not a colony nester. These geese nest early in the season on upland sites or polygonal ridges near wetlands containing Carex and Arctophila near deep open lakes, flooded tundra and beaded streams. Beaded streams appear to be important transportation routes for flightless young and adult white-fronts.

C. Peregrine Falcons and Other Raptors

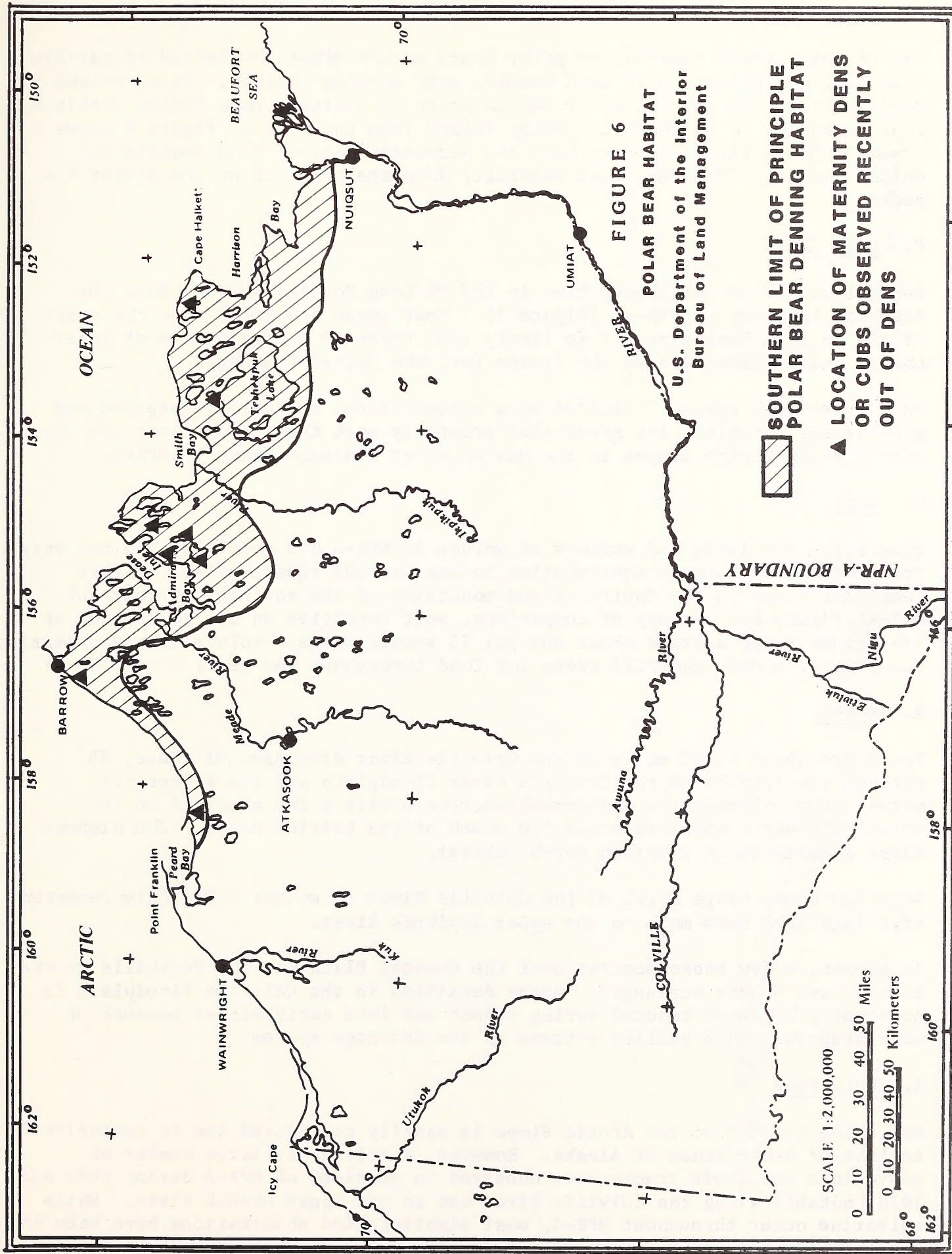
Of the three subspecies of peregrine falcons in Alaska, the endangered Arctic peregrine falcon (Falco peregrinus tundrius) has prime nesting habitat within NPR-A. The Colville River is recognized along with its main tributaries as the main nesting habitat for the endangered Arctic peregrine in North America. Figure 5 shows the nest sites along the Colville drainage as well as other known sites in NPR-A. Fifteen mile radius circles have been drawn from each nest to illustrate the suspected extent of hunting habitat.

Peregrine falcons nest on cliffs, bluffs, rocky outcrops and at the base of rocky faces above talus slopes. Since they are known to return to historic nest sites after years of disuse, all nests sites are important. Current and historic nesting sites are documented for the Awuna, Colville, Etivluk, Ikpikpuk, Kuk and Utukok Rivers. Of the 67 current or historic nest sites, ninety-one percent are on lands withdrawn from leasing due to the Wild and Scenic River Study of the Colville, Utukok and Etiviluk/Nigu Rivers. Lands within two miles of the Colville, Etivluk, Nigu and Utukok Rivers are withdrawn from leasing by the ANILCA to provide time to determine whether these rivers merit permanent designation as wild and scenic.

Five species of other resident or migratory raptors, in addition to the peregrine falcon, are present on NPR-A: golden eagles nest in the Brooks Range and foothills of NPR-A; gyrfalcons nest on cliffs along river courses; rough-legged hawks also nest on cliffs along river courses and at some off-river sites; and snowy owls and short-eared owls nest on the open tundra, primarily on the Coastal Plain. Annual raptor populations in NPR-A vary due to fluctuations in prey populations which affect raptor nesting locations and productivity. None of these other raptor species is endangered in Alaska.

D. Grizzly Bear

The NPR-A grizzly bear population is estimated to be about 400-450 animals. The bears feed in the river valleys out to the Coastal Plain from spring through the fall. The grizzly bear population in southwest NPR-A appears to be more productive than that of the eastern Arctic Slope grizzly bear, possibly because of the proximity to caribou calving grounds. The added protein available from dead caribou cows and calves and occasional calves killed by bears improves bear survival and reproductive success. Grizzly densities on and adjacent to the calving area are well above average grizzly density for the remainder of NPR-A.



E. Polar Bear

Use of terrestrial habitats by polar bears within NPR-A is limited to caribou from October through April when females seek denning habitat. Prime onland denning areas are determined by the location of suitable snow drifts within a zone extending up to 20 miles (30km) inland from the coast. Figure 6 shows areas in NPR-A that appear to have the necessary habitat requirements for onland denning. However, most maternity dens are offshore on the winter ice pack.

F. Dall Sheep

Approximately 400 Dall sheep live in the De Long Mountains which form the Southern boundary of NPR-A. (Figure 7). Most sheep are found near the crest of the De Long Mountains, it is likely that there is a high degree of interchange and movement across the divide into the Noatak drainage.

Dall sheep seek areas of limited snow accumulation, adequate vegetation and good escape terrain. The areas that generally meet these conditions are the south-facing alpine slopes in the Noatak River drainage south of NPR-A.

G. Wolf

Population densities and numbers of wolves in NPR-A are generally low but vary from between one per 60 square miles to one per 200 square miles. Higher densities occur in the foothills and mountains of the southeastern part of NPR-A (Figure 8). By way of comparison, wolf densities on the south side of the Brooks Range average about one per 75 square miles. Wolves depend primarily on caribou, moose, and Dall sheep for food throughout the year.

H. Moose

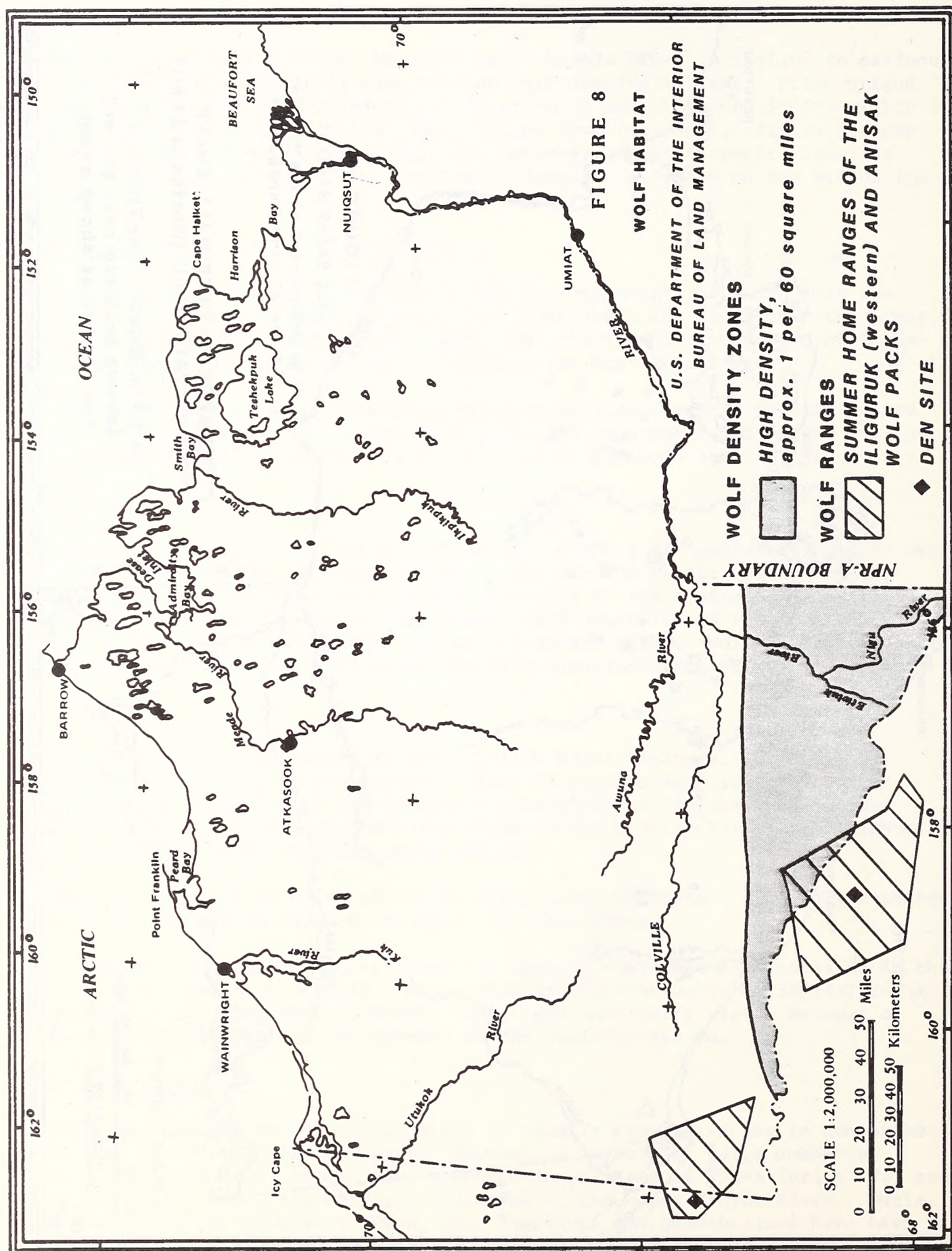
There are about 1,200 moose in the Colville River drainage. Of these, 85 percent are located on the Colville River floodplain and its tributaries between the Oolanmagavik and Anaktuvuk rivers with a few observed on the Colville River floodplain above the mouth of the Etivluk River. The highest moose density is in riparian shrub habitat.

Very few moose range north of the Colville River in winter. The only repeated sightings have been made on the upper Ikpikpuk River.

In summer, a few moose scatter over the Coastal Plain and the Foothills in the Kokolik and Utukok drainages. Moose densities in the Colville floodplain is apparently somewhat reduced during summer and into early winter because of some dispersal into smaller streams of the drainage system.

I. Wolverine

Wolverine density on the Arctic Slope is usually considered low in comparison to that of other areas of Alaska. However, a relatively large number of wolverines and their tracks were observed in portions of NPR-A during 1977 and 1978, notably along the Colville River and on the upper Utukok River. While wolverine occur throughout NPR-A, most sightings and observations have been in the foothills.



SOURCE: (NPR-A TASK FORCE, 1978)

J. Ducks

Ducks populating NPR-A during the ice-free season include both dabbling and diving ducks. The following species of dabbling ducks have been reported: pintails, mallard, green-winged teal, baldpate, and shoveler. The diving ducks consist of oldsquaw, Steller's eider, king eider, common eider, red-breasted merganser, scaup and scoter. Another 20 species of ducks are sighted rarely within the NPR-A.

The greatest densities of dabbling ducks occur within 30 miles of the Arctic coast. Pintails made up 89 percent of all dabbling ducks observed in 1977 and 85 percent in 1978. Diving ducks attain highest densities within 30 miles of the coast between Peard Bay and Smith Bay and as far as 10 miles inland from Wainwright to Icy Cape. Oldsquaw comprised 83 percent of all diving ducks observed in 1977 and 60 percent in 1978. The Teshekpuk Lake Goose Molting Area contains important habitat for both groups of ducks.

K. Shorebirds

Approximately 21 species of shorebirds regularly use the NPR-A. The most numerous species recorded at three intensive study sites in NPR-A were pectoral sandpiper, red phalarope, dunlin, northern phalarope, and semi-palmated sandpiper.

The highest densities of breeding shorebirds in NPR-A are within about 20 miles of the coastline. Breeding populations exhibit relatively even distribution in this zone. Wetlands around river delta systems are extremely productive areas. However, godwits and whimbrels are more common in tussock tundra areas of the Foothills than elsewhere.

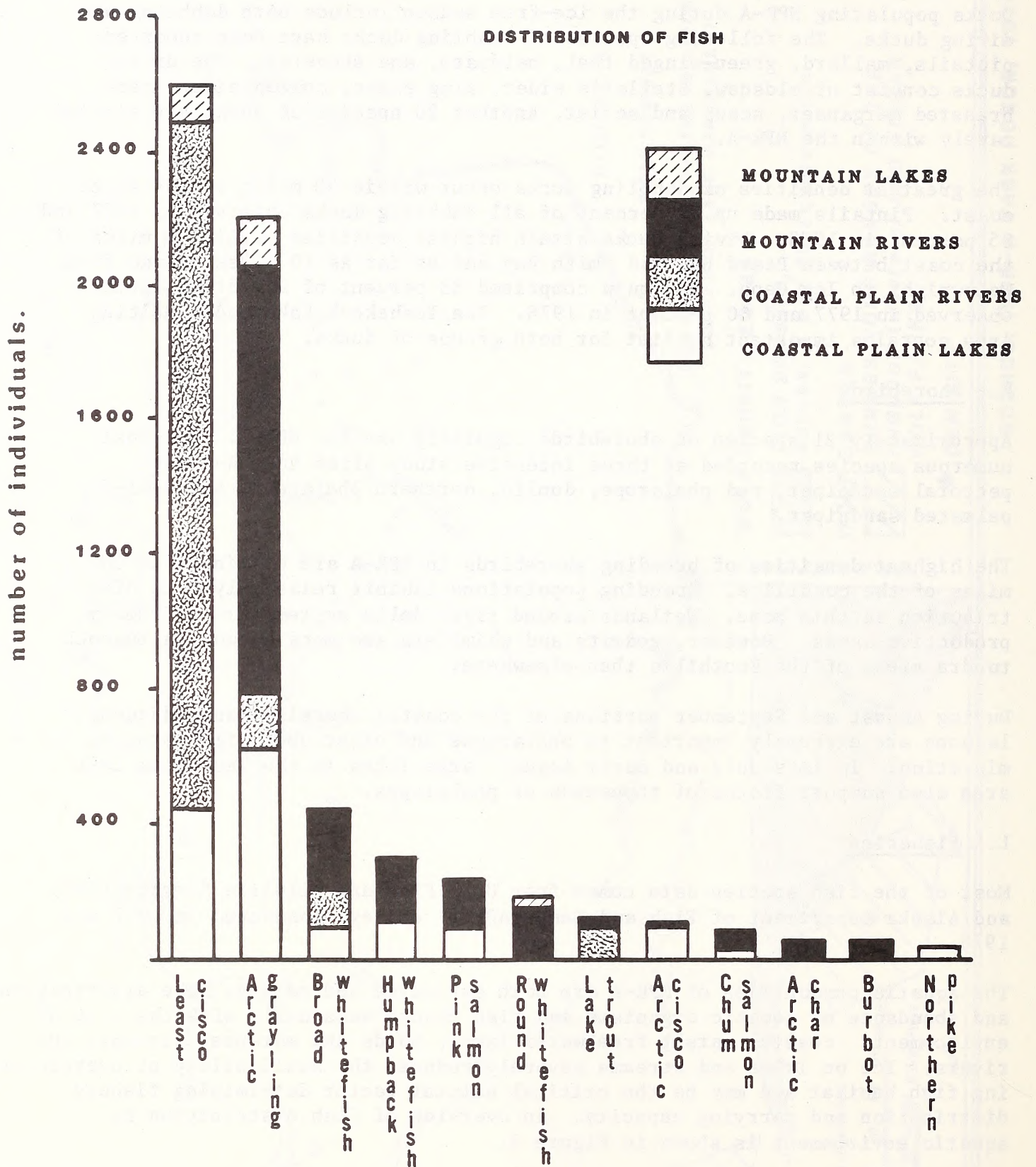
During August and September portions of the coastal shoreline and adjacent lagoons are extremely important to phalaropes and other shorebirds staging for migration. In late July and early August large lakes in the Teshekpuk Lake area also support flocks of thousands of phalaropes.

L. Fisheries

Most of the fish species data comes from U.S. Fish and Wildlife Service (FWS) and Alaska Department of Fish and Game (ADF&G) surveys conducted in 1977 and 1978.

The aquatic communities of NPR-A are both extensive and varied. The distribution and abundance of aquatic organisms and fish change seasonally with the type of environment: coastal marsh; freshwater lakes, ponds and marshes; streams; and rivers. Ice on lakes and streams severely reduces the availability of overwintering fish habitat and may be the critical natural factor determining fishery distribution and carrying capacity. An overview of fish distribution by aquatic environment is shown in Figure 9.

FIGURE 9



Graph showing number of Individuals from selected fish species captured in NPR-A during the open water season, 1977-1978.

SOURCE: (HABLETT, 1979)

The nearshore marine and coastal zone^{*} is believed to harbor 56 marine and 13 anadromous fish species. These include Arctic char, Arctic cisco, fourhorn sculpin, Arctic cod and Arctic and starry flounder. Seasonal abundance of fish along the coast is related to anadromous fish migrations to and from spawning locations, their feeding areas, and overwintering sites. Some freshwater fish not considered to be anadromous may occasionally enter brackish waters and estuaries.

The Arctic Coastal Plain of NPR-A contains the greatest proportion of freshwater surface area in NPR-A. Lakes range in size from the 201,510 acres (81,550 hectares) of Teshekpuk Lake to small potholes. Lakes in the western half of the Coastal Plain are mostly thaw lakes which are too shallow to offer critical fish overwintering habitat. The deeper lakes that are more prevalent in the eastern half of the Coastal Plain are most likely to contain fish populations if they have inlets or outlets, adequate depth for overwintering, and suitable substrates, such as gravel for spawning. Rivers originating on and draining the Coastal Plain are mostly shallow runoff channels that may become intermittent during the summer. They serve primarily as migration corridors, but some, such as the Inaru River on the western Coastal Plain, also may provide limited spawning and overwintering habitat.

The Colville River, which flows east-northeast, intercepts most of NPR-A's Brooks Range drainage system. As a prime fisheries habitat, it provides spawning, overwintering, rearing, feeding and migrating opportunities to a large number of fish species. The Colville River delta's estuarine environment is also prime habitat for most freshwater and anadromous species found on NPR-A, as well as several other species. The hydrological and physical characteristics of the Utukok and Kokolik Rivers are similar to those of the Colville River, although on a smaller scale.

The Kuk, Meade, Topagoruk, Chipp, and Ikpikpuk Rivers originate in the northern Foothills and descend from them across the Coastal Plain and flow north to the Arctic Ocean. Flows are often intermittent in summer. Although few overwintering or spawning sites have been identified on these rivers, they provide essential migration corridors from the Arctic Ocean to inland lakes and headwaters.

Any water known to be or subsequently proved to be spawning, rearing, feeding, or overwintering habitat or a migration pathway is considered important. The Colville River, Teshekpuk Lake, and other deep lakes on the eastern Coastal Plain have the greatest potential for containing large fish populations. However, the Utukok, Meade, Ikpikpuk, and Kokolik Rivers, as well as other waters, also could prove important.

* Those interested in acquiring leases in the nearshore environment are advised that during the conduct of all activities related to leases issued as a result of NPR-A leasing, the lessee and its agents, contractors and subcontractors will be subject to the provisions of the Marine Mammal Protection Act of 1972 and International Treaties. The lessee should contact the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service, as appropriate, regarding restrictions on lease activities.

III. HUMAN OCCUPATION AND USE OF THE ARCTIC

Native peoples have occupied the North Slope area of northernmost Alaska, which includes the NPR-A, for at least 8,000 years. This remote, treeless, mostly frozen land of beauty, comprised of highly fragile terrain and delicate ecological balances is a place where human survival was possible only by the development of a highly sophisticated culture. Consequently, respect for the environment and its resources became the centerpiece of this remarkable culture.

Many of today's North Slope Natives, the Eskimos, or Inupiat (meaning "Real People"), are attempting to continue this traditional way of life. At the same time, new pressures and challenges brought on by such modern technological developments as oil and gas development have led them to adopt a new lifestyle fusing subsistence harvesting with "modern" technologies.

A. History of Settlement Patterns and Population in the Arctic

The North Slope Inupiat did not come into significant contact with Caucasians until the early 19th century. Captain F.W. Beechey of the H.M.S. Blossom explored Alaska's northern coast in 1826 naming Point Barrow and Wainwright, sites within what was to become the NPR-A. By the end of the 1850's, whaling ships were regular visitors to the northern coastal waters. With them came the introduction of firearms, alcohol, and epidemic diseases, all of which changed traditional Native life forever.

As foreign whaling continued through the later 1800's, Inupiat were hired as temporary crew members and guides. Thus began a mixing of wage and native subsistence economic systems that continues today. Continued contact with foreign whalers and later trappers, missionaries, and government officials through the early 1900's began changing the Inupiat in other ways. Their historic patterns of migratory hunting and living in temporary seasonal camps to harvest local resources were slowly modified.

Seasonal mobility was increasingly traded for year-round settlements near such newly established trading posts and missions as the coastal villages of Wainwright and Barrow. By the 1950's most of the inland Inupiat had moved for purposes of education to these coastal settlements or to Anaktuvuk Pass, which is located outside the NPR-A.

Many Inupiat remembered and yearned for a return to the traditional life style. As a result, in the early 1970's two villages within the NRP-A, Atqasuk and Nuiqsut, were reestablished. The 1980 Native and non-native populations for NPR-A villages was:

T A B L E II-1
Composition of NPR-A Village Population

	<u>Alaska Native</u>	<u>Non-Native</u>	<u>Total</u>
Barrow	1,677	608	2,285
Wainwright	341	33	374
Atqasuk	88	13	101
Nuiqsut	183	33	216
Totals	<u>2,289</u>	<u>687</u>	<u>2,976</u>

(Alaska Consultants, Inc. 1981)

1. The Mixed Subsistence/Cash Lifestyle

As used in this DEIS, subsistence has a specific legal meaning. Public Law 96-487, enacted December 2, 1980, defines subsistence uses as: "...the customary and traditional uses by rural Alaska residents of such wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade."

Along coastal and offshore areas of the NPR-A these activities include fishing; collecting of invertebrates, eggs, roots, berries, and other natural resources; and hunting and/or trapping of caribou, polar bears, seals, whales, walrus, birds, and small mammals. Inland additional subsistence activities include the hunting/trapping/collecting of moose, grizzly bears, sheep, and other plants and animals of the tundra.

a. Current Subsistence Uses Within the NPR-A

Socio-cultural research indicates that current subsistence uses within the NPR-A continue to be important to the Inupiat. This includes not only residents of the four NPR-A villages but inhabitants of other Arctic native settlements who benefit from NPR-A subsistence harvesting. Non NPR-A natives receive subsistence resources from customary trade and the harvesting of subsistence resources contributes to the maintenance of cultural identity.

Today subsistence gathering employs such "modern" technologies as snowmobiles, all-terrain vehicles and rifles. Traditional whale hunting also has been modernized by the use of boat motors, radio transmitters, and darting guns and bombs (Worl 1980).

1) Nutritional/Economic Benefits

Many Inupiat, particularly older ones, continue to require such traditional foods as caribou, whale, seal and certain types of birds, fish and wild plants. Research has revealed that the traditional Eskimo diet frequently is more nutritious and healthy than imported foods.

While most processed foods are stocked by Eskimo village stores, their resupply can be hampered by transportation problems particularly during the long winters. Prices are relatively high. For example, in Barrow, Alaska in January 1982 bacon was over \$4 per pound, fresh milk was \$6 a gallon, carrots were \$2.24 per pound, and bananas were \$1.29 per pound (Robert E. King, unpublished field notes). Many Inupiat simply cannot afford such prices. A 1980 study showed that 65 of 461 Eskimo households surveyed in northern Alaska reported under \$10,000 annual income, with the average household containing about 4.7 people (Alaska Consultants, Inc. 1981). Hunting, fishing, and gathering are essential for these lower income households.

2) Socio-cultural Benefits

Traditional activities related to subsistence uses still serve significant social functions in helping bind Eskimo communities together and providing cultural solidarity, status, and identity to individuals. Wild resources

obtained by hunting, fishing, and gathering in the NPR-A continue to be shared and exchanged among families and villages. For example, certain Inupiat in Barrow trade various foodstuffs, including whale and caribou obtained in their area, with Inupiat of Kaktovik, Point Hope, and other North Slope villages. Today trading often is conducted via commercial airflights between villages, another example of modern technology used to accomplish centuries-old behavioral patterns.

A study published in 1970 noted that "...most adult Eskimos in North America are members of at least one trading partnership, and many are involved in several" (Burch, 1970). A Native of Kaktovik located 180 miles east of the NPR-A is a member of at least five governmental advisory groups on fish and game management and Eskimo subsistence needs (Robert E. King, unpublished field notes, 1982). This requires his frequent attendance at meetings in Anchorage, Nome, and elsewhere. This "Eskimo bureaucrat" trades with Barrow and Point Hope relatives for "muktuk," whale skin, which is a traditional Inupiat delicacy. In turn he shares muktuk by air mail with a sister in Iowa and other relatives in Canada.

Recent surveys of community values among North Slope villages indicate that subsistence activities are regarded not only as very important components of community and cultural life, but also key reasons for continuing to reside in the harsh environment of northern Alaska. Inupiat participation in subsistence activities has remained remarkably stable over time (Kruse 1981). Living a more traditional lifestyle of hunting, fishing, and gathering is still highly valued by many Inupiat.

b. The Cash Economy

As mentioned previously Inupiat participation in the wage economy has been increasing. By 1980, the average cash income per Native household within the four NPR-A villages was between \$20,000 and \$30,000 (Alaska Consultants, Inc. 1981).

Money earned in the cash economy frequently is channeled back into the subsistence activities to buy equipment necessary for hunting. This includes the purchase of rifles, shotguns, ammunition, snow machines, boats, sleds, gas, and various items necessary for whaling.

c. Inupiat Perceptions of Desired Land Uses and Needs

The western concept of private individual ownership of land is a "new" idea for the Inupiat. While certain group territorial boundaries were generally mutually recognized and even defended vigorously at times (Burch 1980), the land and its wild resources were viewed as available for use by all. Man was seen as part of nature, with an obligation (ritually expressed at times) to respect and live in harmony with the land and its resources. The frequently precarious existence of the Arctic environment led the Eskimo to develop a spiritual relationship to their natural environment.

One Inupiat described this spiritual relationship as a: "community... united spiritually and physically to make it possible to survive in the Arctic. They were and they recognized they were a tribal people who had a common bond." (NPR-A staff notes, Barrow Public Meeting 1981). The speaker noted "drastic changes" in this sense of community during the past 20 years.

Another Inupiat attempted to discuss the native feeling for the land in terms an outsider might comprehend:

What if we Inupiat entered into the lands of another race and presented them with plans and regulations for drilling in their gardens. I feel that if we Inupiat did that we would probably be put in jail...The Inupiat people are going through hard times. We Inupiat have no gardens. When (the Trans-Alaska) pipeline went through it disturbed the caribou. I am very concerned about the caribou--they are our garden...We also know where to look in our garden for the things we need. We must go inland for the caribou and to sea for the seals. It is harder for us to reach our gardens. Your gardens are more accessible. While we were inland my husband encountered a white man and he told us that we couldn't hunt in that area. Two other whites with guns also told us that we couldn't hunt there...my uncle is over 60 years old and this is his lifestyle. Yet whites with guns told them that they couldn't live that lifestyle. We were frightened and left. This happens because of white man coming in here with regulations for our gardens..." (Ibid.).

A major concern frequently expressed by Inupiat is that if oil and gas development must come, it should be with great caution and sensitivity to local resources and Native land uses and needs. One Inupiat, not against oil and gas development who realized the Inupiat can't go without oil and gas for fuel (notes of Nuiqsut Public Meeting, June 1982), stated he wished development to be done cautiously with care given to all resources.

Others at the same meeting spoke of potential dangers to subsistence activities from future oil and gas spills, dumping of sewage and other pollution, noise and development activities, scaring away animals and fish, or need for buffer zones to protect sensitive habitats, and the problem of their prime subsistence areas and sacred sites being made known to non-natives who might desecrate them.

One indicator of important subsistence harvesting locations as an existing and desired land use is the distribution of native allotments. Native allotments represent areas of subsistence use over several generations. Tracts with allotment filings are shown in Table II-2.

Other sources of information on areas of great subsistence value include (1) prior independent ethnographic research, (2) the government funded 105(c) Studies, (3) information on Traditional Land Use Sites compiled and updated by the North Slope Borough and (4) content analysis of testimony and statements made by Inupiat elders, hunters and leaders. Based on these data, DEIS discussion tracts were sorted according to categories of subsistence value. A map showing these subsistence value ratings is available from the Fairbanks District Office, Bureau of Land Management, P.O. Box 1150, Fairbanks, AK 99707.

T A B L E II-2
DISTRIBUTION OF NATIVE ALLOTMENT FILINGS*
(See Plate One For Tract Locations)

<u>Tracts With One or Two</u>		<u>Tracts With Three or Five</u>		<u>Tracts With Six or More</u>	
<u>Tract No.</u>	<u>Number of Allotments</u>	<u>Tract No.</u>	<u>Number of Allotments</u>	<u>Tract No.</u>	<u>Number of Allotments</u>
2	1	10	3	36	7
31	2	15	3	48	16
32	2	17	4	58	9
41	2	26	4	59	6
44	2	34	4	75	6
47	1	35	5	94	6
67	2	55	3	117	6
69	1	71	3	147	14
72	1	88	3	177	8
76	1	100	4	196	12
79	1	127	3		
80	1	160	3		
82	2	161	5		
93	1	176	5		
108	1	179	5		
109	1	197	5		
144	1				
195	1				
Totals	25		62		90

* Those interested in acquiring leases within NPR-A involving lands where private surface overlies Federal minerals, as in the case with native allotments, are advised that Federal permits authorizing entry onto the private surface for the purpose of commencing operations or beginning facility construction will not be granted unless the permit applicant has established that permission from the surface owner to enter on said surface has been obtained. The surface owner permission must be in written form such as a surface occupancy lease.

B. Cultural Resources

Although only an estimated two to three percent of the 23 million acres (9.3 million hectares) on the Reserve has been studied to date, more than 1,000 known archeological sites within NPR-A have been identified. Surveys of the Howard Pass-Inyorurak Pass Area, as well as many of the larger lakes located in the Howard Pass Quadrangle (1:250,000 scale USGS quad), show a high density of sites.

Table II-3 lists tracts with sites known to be eligible for the National Register of Historic Places and tracts with known archaeological sites. Its primary source was the Alaska Heritage Resource Survey (AHRS) Index maintained by the Alaska State Historic Preservation Office. The summary is based on data on file through February, 1982 and supplemented by site location data generated by the BLM/USGS NPR-A cultural resource program which is not yet listed on the AHRS Index.

T A B L E II-3
NPR-A Tracts Having Known Archaeological Sites

Tract Number	Number of Sites	Number of Sites
		Meeting Eligibility Standards For the National Register of Historic Places
26	1	yes
54	1	no
59	2	yes
64	1	no
65	2	no
69	1	yes
83	1	no
84	1	no
85	2	no
87	1	no
98	2	no
104	1	no
109	1	no
112	3	no
125	2	no
133	2	no
134	5	no
147	5	no
148	1	no
150	1	no
160	8	no
161	2	no
176	2	no
177	1	no
179	1	no
195	2	no
196	2	no
197	1	no
200	1	no
205	1	no
217	2	no
223	2	no
251	1	no
330	1	no
338	1	no
339	2	no
355	2	no
357	3	no
359	2	no
373	3	no
374	1	no
378	5	no
378	2	no
393	6	yes
396	2	no
409	7	no
410	7	no
411	11	no
412	14	no
413	2	no
421	2	no
424	4	no
425	2	no
430	1	no
436	2	no
437	22	no
438	4	no
439	3	no
440	12	no
441	1	no
443	1	no
444	5	no
445	12	no
446	17	no
447	25	no
448	19	no
449	14	no
450	2	no
452	1	yes
464	8	no
472	42	no
474	1	no
483	1	no
484	4	no
485	4	no
486	1	no
489	4	no
492	2	no
493	2	no
494	2	no
497	44	yes
498	1	no
499	11	no
500	13	yes

Maps identifying the AHRS site designations occurring within each discussion tract are available in the Arctic Resource Area Office in Fairbanks. They identify the exact location of each site within the tract as well as key bibliographic references. Discussion tracts for which no known sites are reported are not necessarily devoid of cultural resources. Most tracts have never been examined for the presence of cultural resources. The number of sites within a tract does not reflect the density of cultural resources within it but rather the intensity and extent of archeological surveys.

Tracts which contain properties listed on the National Register of Historic Places are identified so that potential Lessees may plan their activities to allow for sufficient time for the BLM to comply with Section 106 of the Historic Preservation Act of 1966 and the Archeological Resources Protection Act of 1979. Not all eligible sites have been listed on the National Register so discussion tracts which contain sites that should be listed on the National Register are also identified. However, given how little is known of the prehistory and history of the NPR-A, virtually all of NPR-A may qualify for NRHP listing under the criterion "likely to yield, information important in prehistory or history (36FR60.6d)."

When surface disturbing activities are proposed within any of the discussion tracts, the affected terrain will have to be examined by an archeologist. All sites identified by the archaeologist will have to be evaluated for National Register eligibility.

The archeological potential of the discussion tracts is a subjective judgment based on familiarity with the terrain and available information. Where no reliable survey data exists for a tract, potential was estimated by extrapolation from similar tracts previously surveyed or from the literature. Low potential was listed for tracts lying under water. Given current knowledge, most tracts were listed as having moderate potential.

The presence of cultural resource sites or National Register properties does not bar leasing. Given the large size of lease tracts, surface disturbing activities can be relocated to avoid impacts to cultural resource sites. Consultation with the State Historic Preservation Office and Advisory Council on Historic Preservation is essential to assure appropriate mitigation.

IV. RECREATION AND PRIMITIVENESS

During scoping the public identified recreation as both an existing use of NPR-A and a potential impact. Increased recreation associated with roads to oil fields could lead to disturbance of peregrine falcon and caribou. Roads and other oil and gas facilities were also seen as potentially degrading to the wild character of NPR-A.

Most of NPR-A today remain in a primitive state. The human population of NPR-A travels extensively overland by motorized vehicles, primarily snow machines. Seasonal dwellings or fish camps are scattered throughout the area. Overall the Reserve's 23 million acres (9 million) remain a natural area, untrammelled by man, with very few obvious signs of modern man's influence or presence. A visitor to the area or an inhabitant of one of the few settlements in or near NPR-A can easily find opportunities for solitude. The Reserve contains many both large and small areas of ecological, geological, scientific, educational, scenic, and historical value.

The recreational opportunities on NPR-A are limited in relation to the size of the Reserve. Few of the thousands of lakes on the Coastal Plain support sport fish. Game animals are abundant only in some areas and few are of trophy size. In summer the tussocks and boggy terrain make cross-country hiking difficult over most of the Reserve, particularly in the Coastal Plain and northern foothill regions. Few of the rivers contain sufficient water for floatboating for more than a week or two each summer. North Slope weather is often severe with frequent winds and low fog layers. This affects the recreational opportunities of the region. However, specific parts of the Reserve offer recreational opportunities which are enhanced by the extreme remoteness of the area. There are few places other than NPR-A where one can be 100 or more miles (about 200 kilometers) from any human settlement. For many people this isolation provides opportunities for an uncommon wilderness experience.

The De Long Mountains along the southern boundary of NPR-A seasonally offer opportunities for backpacking, exploring, nature photography, wildlife viewing, camping, limited fishing and hunting and viewing of varied scenery. When such major rivers as the Colville, Utukok, and Etivluk-Nigu contain a sufficient flow of water, they provide opportunities for float trips wildlife viewing fishing, hiking the river valleys and ridges, camping, hunting, sightseeing, and nature photography.

Primitive recreation opportunities are also available along portions of the Chukchi Sea coastline. With the prevailing wind at their backs, travelers can paddle small boats or kayaks from Wainwright to Icy Cape. The barrier islands, paralleling the shore for more than half of the distance, offer some protection from the wind and ocean currents. During the summer visitors can be rewarded with unusual views of marine mammals migrating just offshore, multitudes of waterfowl, and possibly the drifting pack ice floating close to shore.

Depending on the skill, initiative, experience and equipment of the participant, parts of NPR-A are attractive for winter recreational activities. Late winter or early spring is best since temperatures are usually higher and the days are longer than in midwinter. Currently, there is little winter recreational use of the Reserve. However, gentle terrain and wind-packed snow throughout much of NPR-A create conditions favorable for dog sledding, snow-machining, and cross-country skiing.

Because of the difficulty in reaching NPR-A, most of the present recreation-oriented visits to it are tours to Barrow where the area's organized tourist activities and facilities are located. Tourism may increase to the Reserve if visitor-oriented facilities and activities such as a native culture center, guided trips to archeological sites and other points of interest, and scenic overflights and guided dog team or snow machine trips are added.

V. ENVIRONMENTAL QUALITY ISSUES

Three universal concerns associated with development in any environment are:

- ° Project requirements for water and changes in water quantity or quality;
- ° Changes in air quality; and
- ° Project effects on soils and erosion.

Effects of NPR-A development on these three Environmental Quality (EQ) Concerns are discussed below in Chapter Three. The information below describes the current situation for these EQ issues on the North Slope.

A. Soils

Two major soil units comprise the Arctic Coastal Plain. Roughly centered within the province is a soil unit dominated by sandy eolian, alluvial, and marine deposits. Within this unit, poorly drained soils with shallow permafrost tables occupy most of the nearly level areas and the broad swales between dunes. The soils on dunes consist of eolian sand which is generally thawed and well drained to a depth of about 10 to 20 inches (50-80 cm). Bordering to the east and west is a unit which consists of deep loamy ice-rich soils that are poorly drained and have shallow permafrost tables. Very poorly drained fibrous peat soils are also common within both units as are some well drained soils along major active drainages.

The dominant soil unit within the lower elevations and gentler slopes of the Foothills province consist of silty colluvial and residual material weathered from fine-grained, nonacid sedimentary rock. These soils are poorly drained and are generally ice-rich with a shallow permafrost table. A few well drained soils can be found within this unit along narrow river terraces, sharp ridge lines, and along a few short south-facing slopes near ridge crests. On the more rugged uplands in the northern Foothills many of the soils are formed in a very gravelly material weathered from sedimentary rock. Near the Brooks Range a few soils have formed in a very gravelly glacial drift. These soils are generally poorly drained with shallow permafrost tables except along steep south-facing slopes.

The Brooks Range area is dominated by steep rocky slopes and thin gravelly soils on vegetated lower slopes and in valleys. In lower valleys some soils have formed in gravelly glacial till or gravelly colluvium or residual material weathered from calcareous rock. Some well drained soils are located on gravelly ridges, hilly moraines, south-facing colluvial slopes and along major active drainages.

Polygonal ground is characteristic of permafrost regions and is widespread in the NPR-A. The polygons are easily seen in summer, but are visible in winter as well because of unequal snow distribution. Polygons range from about 30 ft (10 m) to about 200 ft (70 m) in width. The edges of polygons are generally low and in places the margins may be masked by sedge tussocks. Polygons are separated by interconnected ice wedges whose tops are a few inches to several feet wide and which extend to depths of 10 (3 m) to about 18 ft (6 m). Most of the polygons visible on the surface of the Coastal Plain have central depressions and upthrust ridges at their outer edges that impede drainage from within the polygons.

Wherever the slope of land permits drainage, "high-centered" polygons may form. Where the tops of the ice wedges between polygons thaw, and the water drains off, the overlying material, and often the edges of the polygon, will slump into the trough created by melting. This continuing process produces ditches between the polygons but can occur much more rapidly depending on the rapidity of thaw and drainage.

Permafrost is also responsible for the formation of ice-cored mounds and pingos, some of which are 100 ft (30 m) high. The upward thrusting characteristic of pingos is related to the growth of an ice mass fed at the bottom by a water supply enclosed in a permafrost basin.

Degradation of the insulating quality of the tundra cover over permafrost increases the range of temperatures in near-surface permafrost and induces deeper thaw. Such damage on slopes can initiate erosion that may continue for many years. In flat areas, tundra damage can cause melting of ground ice in the upper parts of ice wedges and the formation of thermokarst topography. In addition, destruction of tundra often creates mudholes and ruts which modify wildlife habitat and compound the problems for construction and maintenance.

B. Air Quality

In general, the air quality on the North Slope, including the NPR-A, is very good and no violations of ambient standards have been documented in this region. Moderate sized industrial growth is allowed in Class II areas while at the same time assuring maintenance of very high air quality. In a Class II area industrial growth may use up to an incremental 25 percent of the National Air Quality Standards.

The NPR-A is generally characterized by a relatively strong wind field. This minimizes the likelihood of pollutant buildup often experienced during stagnant (thermal inversion) conditions. However, the Arctic Coastal Plain is, in winter, subject to inversion (ice fog conditions) which may lead to pollutants being trapped near the surface.

C. Water Resources

Precipitation (primarily snow), surface storage and surface runoff, evaporation, transpiration, and sublimation are the major hydrologic processes in the Arctic, but the hydrologic regimen of NPR-A is dominated by spring breakup and snowmelt runoff. Short-term changes in water stored in the shallow active layer may also be significant.

Surface storage plays a principal part in the hydrologic cycle. Numerous lakes and virtually continuous permafrost greatly increase active storage. Aufeis and river ice cover also provide surface storage in the mountains and foothills. Aufeis, however, is comparatively rare in the NPR-A.

Ground-water flow systems play only a minor role in the hydrology of the NPR-A. The presence of permafrost limits the depth of the active layer on the coastal plain to about 2 ft (about 0.6m). The active layer stores enormous amounts of water where surface drainage is poor. Near and below deep rivers and lakes, an unfrozen zone (talik) may extend deeper, and pockets of water may remain unfrozen there year-round. Although zones beneath lakes may remain unfrozen, the sediments are usually fine-grained and yield little water. The permafrost barrier severely limits ground-water recharge and discharge in the NPR-A.

Rivers and streams in the NPR-A can generally be classified in three broad categories based on the physiographic province in which they originate. The rivers with the greatest discharge (Colville and Utukok) rise in the Brooks

Range and northern Arctic Foothills; those rivers originating in the southern Arctic Foothills are of medium length and discharge; and those originating in the Arctic Coastal Plain are short and have a small discharge.

Runoff in the NPR-A is characterized by a snowmelt flood in the spring and generally low flow throughout the summer, punctuated by infrequent rainstorm floods. Runoff from rainstorm floods may exceed that of spring runoff, especially on rivers with headwaters in mountains where heavy summer rainfalls may be combined with snowmelt.

An interesting type of stream, the beaded stream, is a string of ponds which are connected by running surface water only during periods of high streamflows. At low water, the ponds may be isolated or connected only by water passing through the streambed materials. The aquatic animals remaining in these pools may, over the years, develop genetic differences from populations in streams whose channel flow is continuous. Beaded streams are an important resting and feeding area for migrating waterfowl arriving on the North Slope during migration.

Lakes dominate the surface of the Coastal Plain in the NPR-A; in many of them the long axes are oriented slightly west of north. The morphology of the Coastal Plain thaw lakes (the most common type of lake) appears to be primarily controlled by ground ice volume, local and regional relief, and basin age.

The largest thaw lakes would be expected to exist in areas of fine-grained, ice-rich sediments where lake expansion is unconstrained by local relief. The orientation of the thaw lakes is primarily linked to preferential shoreline erosion induced by waves and nearshore currents perpendicular to the prevailing summer winds and the local relief. Lakes formed by the action of Pleistocene or more recent glaciers occur in the mountainous section of the NPR-A. Most of the upland lakes appear to have been formed in geomorphic depressions.

Near the coast the lake water-level elevations range from zero to 50 ft (0 to 16 m) above sea level, and depths ranged from 3 to 20 ft (about 1 to 6 m). However, most of these lakes are about 3 ft (1 m) deep. Lakes further inland on the Coastal Plain range from 50 to about 400 ft (15 to 120 m) above sea level. The depths ranged from 3 to 60 ft (about 1 to 20 m), but again most of the lakes were less than 3 ft (1 m) deep. The lakes in the southern Foothills and Brooks Range area that are at altitudes of 1,700 to 3,300 ft (520 to 910 m) and ranged from 3 to 100 ft (1 to 30 m) in depth but most are less than 18 ft (5 m) deep. Lakes less than 6 feet (2 m) deep freeze to the bottom in winter. Therefore, lake depth is a major factor in determining the feasibility of using a lake as a water source in winter.

The water of streams and rivers within the NPR-A is generally soft and dilute of the calcium bicarbonate type except where it is affected by salt water near the coast. Total dissolved solids (TDS) measurements indicate concentration of less than 100 milligrams per liter (mg/L), with few exceptions, during the open water period. The general range of values in chemical quality analyses indicate that quality is a function of discharge. In the case of dissolved solids, the concentration is highest when discharge is lowest.

A major factor in the variability of water quality in surface water in NPR-A is extensive freezing. Deep parts of river channels (such as in the Colville) have water beneath the ice during the winter. When ice cover has reached its

maximum thickness, the small amount of water remaining in river pools becomes quite saline or mineralized as a result of concentration of the salts rejected by the ice and, in some places, contact with brackish bottom sediments.

Water from lakes near the Arctic coast is of the sodium-chloride type, having chloride concentrations of up to 30 mg/L. However, most of the surface (lake) water on the Arctic Coastal Plain is of a calcium- or magnesium-bicarbonate type. Most of the analyzed water is soft to moderately hard and has a low to moderate total dissolved solids (TDS) concentration.

Numerous investigators have reported high concentrations of iron in coastal plain lakes. The formation of thick ice cover on ponds has the same effect as it does on river pools. The remaining water has a high specific conductance and may be saline.

Some lakes experience severe deoxygenation beneath the ice in the winter. Deep snow cover on some lakes reduces the light penetration and slows the photosynthetic activity which can further reduce DO levels. Ice cover for about eight months also prevents atmospheric oxygen from reaching the water.

Water in lakes and ponds in the Arctic Foothills and Brooks Range is of calcium-bicarbonate type and is soft to moderately hard (10 to 100 mg/L CaCO_3). All of the reported sulfate, chloride, and TDS concentrations appear to be significantly below recommended limits for drinking water, but reported iron concentrations exceeded these limits.

CHAPTER THREE

DEIS ANALYTICAL CASES AND IMPACT ANALYSIS FOR SELECTED VALUES

I. INTRODUCTION

This chapter is divided into two sections: a discussion of likely types and levels of North Slope oil and gas development activities to establish an analytical basis for impact prediction and; the impact analysis for selected NPR-A Type Two surface resources. The classification system which resulted in certain resources being labeled as "type two" is discussed in Chapter One on page 7.

II. ILLUSTRATIVE NPR-A OIL AND GAS DEVELOPMENTS

To facilitate discussion of the likely types and level of impact which could result from NPR-A development several illustrative fields were developed and fully combined into analytical cases by the DEIS preparers. These cases are fully described in Shepard, Bennett and Gilliam, 1982, which is incorporated by reference into this DEIS. Table III-1 lists these fields showing the anticipated number of wells and the barrels of recoverable oil (BBL-RO) predicted for each field. All of the discussion concerning the design and operation of those illustrative fields is drawn from Shepard et al. 1982. The discussion of exploration activities is partly based on information provided by drilling firms.

A. Exploration

The oil and gas exploratory program within NPR-A is anticipated to include between 14 and 18 exploratory wells over a period of 16 years. Leases in NPR-A carry a 10 year primary term. Those that result from the first two NPR-A sales will expire in 1992 and leases issued in 1987, the last year of the five year leasing program, will expire in 1997. Within these 16 years, one exploratory rig could adequately drill these 14 to 18 wells. This level of exploratory activity is equivalent to the Federal exploration program conducted from 1977 through 1981.

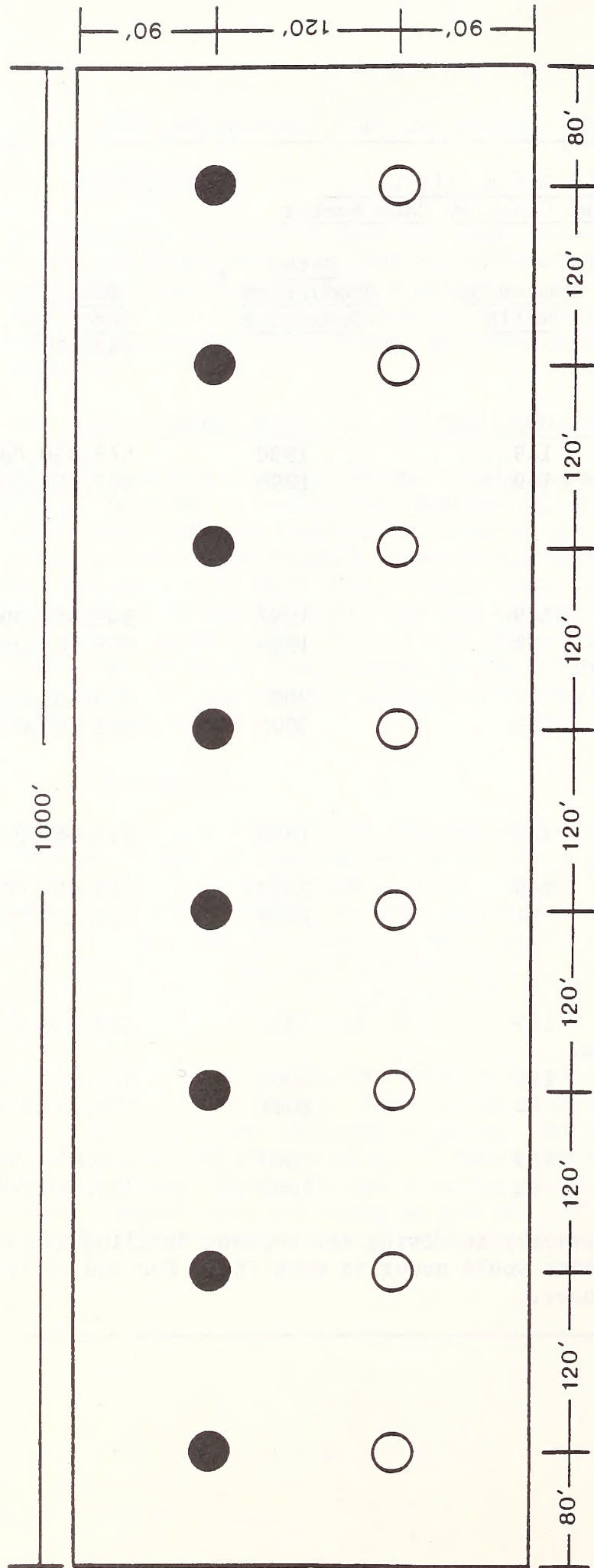
It is likely that the infrastructure of shore bases, airstrips, etc. developed in support of the Federal exploratory program would provide support for at least part of a new industry program. The workforce requirements of one drilling rig are estimated at 50 employees at the work site at any time (Dallas Cross, Alaska United Drilling, pers. comm. 1982). Because some crew members would work two weeks on and one off, while others would work two on and two off, it would take 86 workers to cover these 50 jobs.

T A B L E III-1
Analytical Cases By Case Number

<u>Fields</u> (or Field Complexes)	<u>Number of</u> <u>Wells</u>	<u>Date</u> <u>Production</u> <u>Commences</u>	<u>Total</u> <u>Reserves</u> (BBL-RO)
<u>Case One</u>			
Liberator	149	1990	543,850,000
Prince Creek	149	1990	543,850,000
<u>Case Two</u>			
Chipp River/Alaktak Complex			
Chipp River	149	1997	543,850,000
Alaktak	92	1998	335,300,000
Smith River/Kogru Complex			
Smith River	92	2000	335,300,000
Kogru	149	2002	543,850,000
<u>Case Three</u>			
Liberator	149	1990	543,850,000
Avingak/Utukok Complex			
Utukok River	149	2003	543,850,000
Avingak Creek	92	2003	335,300,000
<u>Case Four</u>			
Liberator	149	1990	543,850,000
Peard Bay/Point Belcher Complex			
Peard Bay	149	2002	543,850,000
Point Belcher	92	2002	335,300,000
Avingak/Utukok Complex			
Utukok River	149	2003	543,850,000
Avingak Creek	92	2003	335,300,000

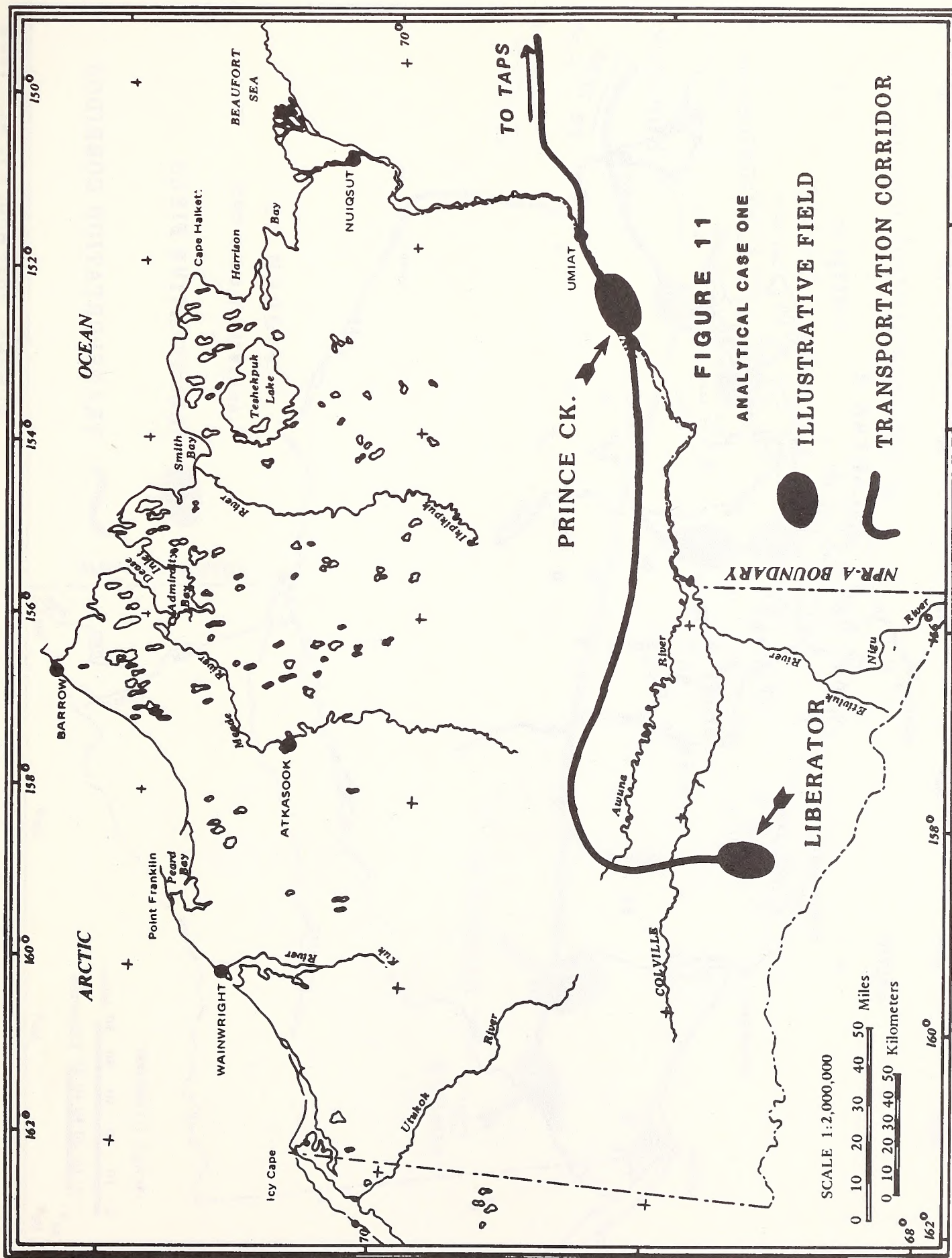
* A burst of high intensity activity involving development drilling and road, pipeline and facility consruction would occur in each field for two to three years before production commences.

FIGURE 10

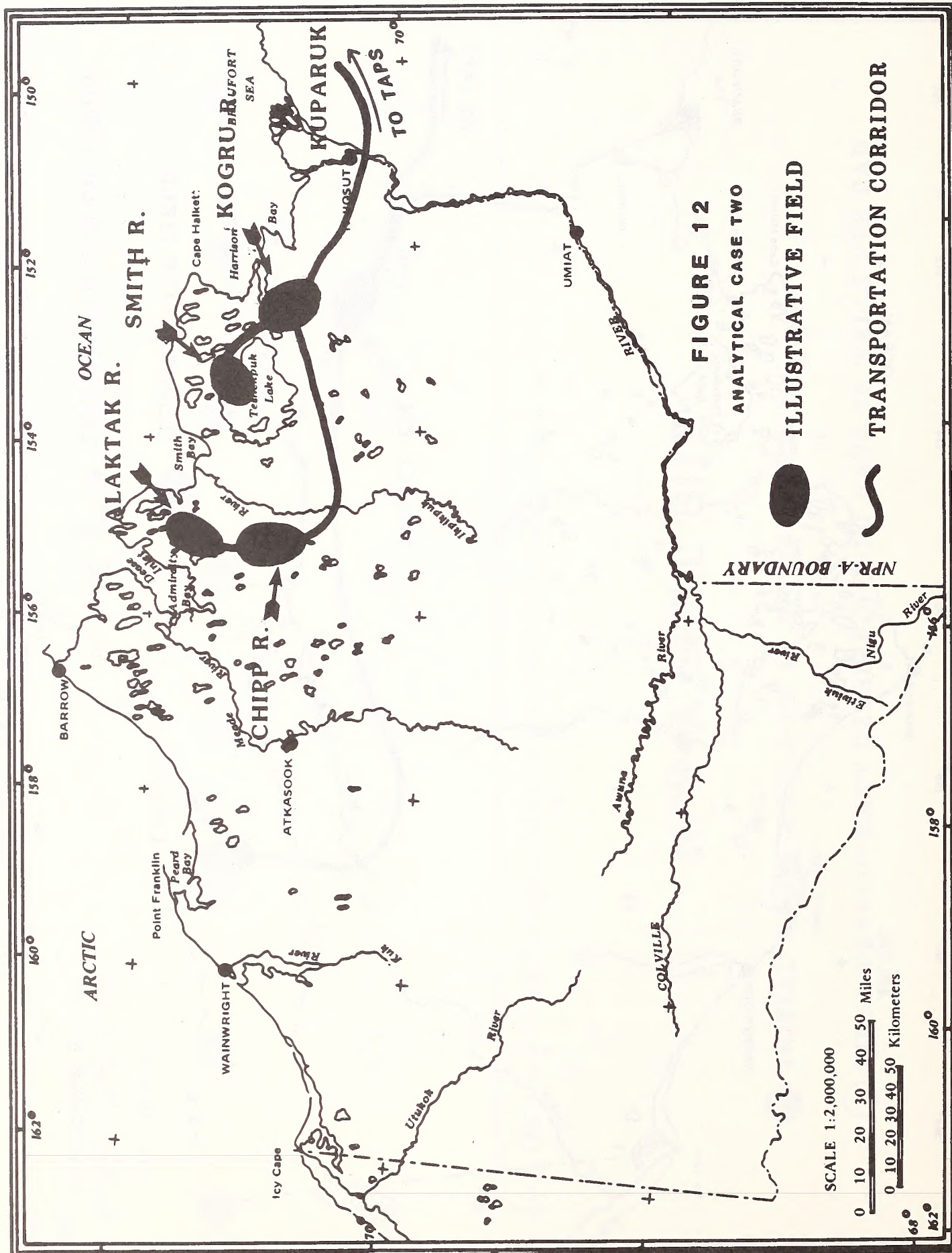


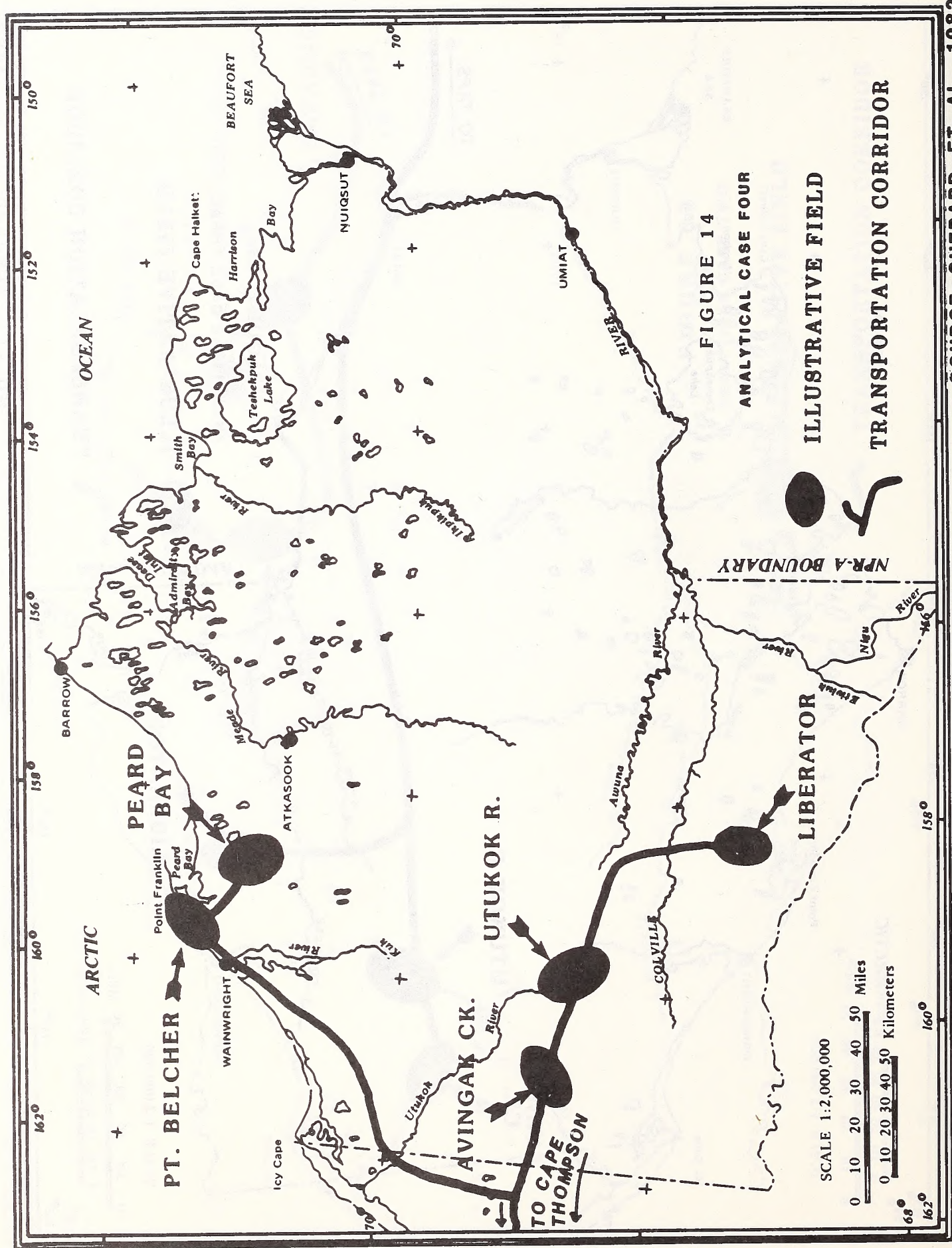
NPR-A DRILL SITE

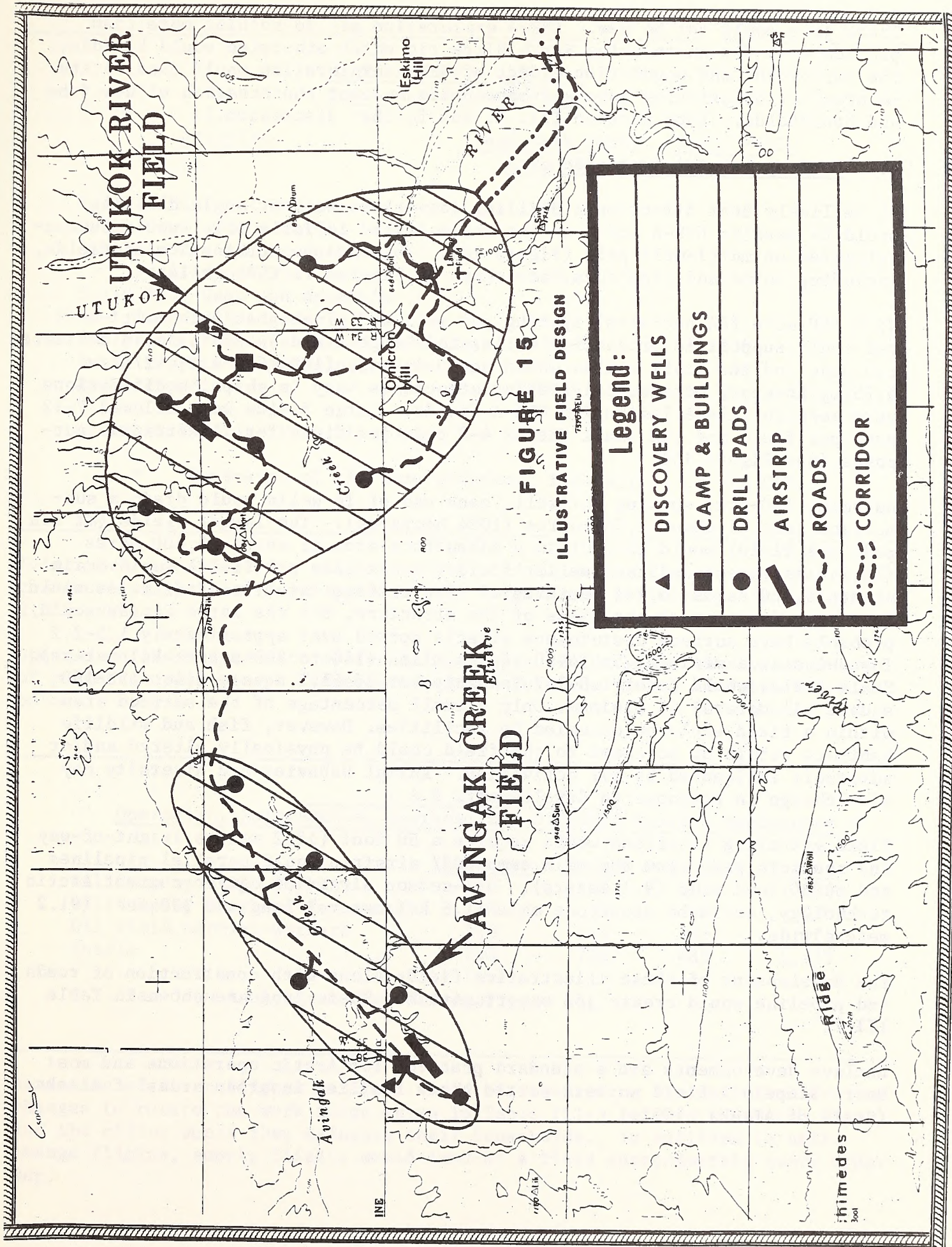
- INITIAL WELLS WOULD BE AT 320 ACRE SPACING
- FINAL DEVELOPMENT DENSITY WOULD HAVE 16 WELLS PER PAD



SOURCE: SHEPARD, STAN; KEITH W BENNETT AND JAMES K. GILLIAM, 1982







These jobs would not be new. NPR-A exploration may do nothing more than provide work for an existing North Slope rig which otherwise would be idle. The employment and population effect of NPR-A exploration would thus be the maintenance of existing jobs and households and not the creation of new jobs and households. (See Section III. E. for further discussion.)

B. Development And Operation

It is likely that directional drilling (deviated, bent or angle drilling) would be used in NPR-A and that the wells listed in Table III-1 would be consolidated on multi-well pads (Figure 10). The various combination of fields, including roads and pipelines, are shown in Figures 11 through 14.

With 160-acre (64 hectares) spacing per well and given that each multi-well pad could support 16 production wells, the large fields would have an estimated ten pads and the small fields would have six pads ($149/16 = 9.3$; $92/16 = 5.75$). However, because oil-bearing structures vary in shape, modifications were made for the illustrative NPR-A fields. Large fields were allowed 7-12 pads per field and the small fields 4-8 pads per field for illustrative purposes (see Figure 15).

Assuming 160-acre spacing per well, each pad of 16 wells would drain a subsurface area of about 2,560 acres (1024 hectares). The larger fields (at ten pads per field) would then drain a subsurface area of about 25,600 acres (10,240 hectares) and the smaller field (at six pads per field) would drain about 15,360 acres (6,144 hectares). The surface extent of facilities would vary as a function of the shape of the structure, but the large fields would probably have surface disturbance effects spread over approximately 1.5-2.2 Townships at a minimum, or 54-80 square miles (140 to 208 square kilometers). Small fields would cover 1.0-1.7 Townships or 36-61.2 square miles (93-160 square kilometers) at minimum. Only a small percentage of the surface area within a field would be occupied by facilities. However, fish and wildlife habitats within or adjacent to the field could be physically altered and/or adversely influenced by oil activities. Animal behavior and diversity may also change in response to development.

Field gathering pipelines would require a 50 foot (15.2 meters) right-of-way. Any roads to pads from the main camp pad/ airstrip would parallel pipelines and be 30 feet wide (9.1 meters). All-season airstrips, given current Arctic technology, would be about one mile (1.6 kilometers) long and 300 feet (91.2 meters) wide.

The development of these illustrative fields along with construction of roads and pipeline would create job opportunities. These jobs are shown in Table III-2.

Enclave developments are a standard practice for Arctic operations and most North Slope oil field workers settle their families in urban areas of Alaska. (State of Alaska, 1982.)

T A B L E III-2
Construction Employment

<u>Activity</u>	<u>Peak Work Force</u>	<u>Small Field</u>
	<u>Large Field</u>	
Build Additional Well Pads	60	30
Drill Development Wells	125	65
Assemble Central Production Facility (CPF)	750	750
Build Base Camp and Assemble Camp Buildings	*	*
Build Intrafield Roads and Pipelines	120	90
Build Pipeline/Road Maintenance Camps	200	90
Build Pipeline	1000	Would share large field pipeline.
Assemble Pipeline Pump Stations	60	

* Extension of the same personnel that worked on the CPF.

Total peak employment for all concurrent activities associated with the construction phase of development of one large field would range from 2,095 to 2,315 workers.

Operations and maintenance of the illustrative fields would involve a number of permanent employees. These permanent workers are listed in Table III-3 below.

T A B L E III-3
Operation, Maintenance, Overhead and Oilfield Service Employment *

	<u>Liberator</u>	<u>Utukok</u>	<u>Avignak</u>	<u>Totals</u>
Oil Company Field Workers	490	490	300	1,280
Oil Company Overhead Personnel	90	90	90	270
Oil Field Service Workers	140	140	95	375
Totals	720	720	485	1,925

* Based on Analytical Case Three, Figure 13.

An estimated three flights per week would be required on the day of shift changes to rotate the work force shown in Table III-3 between the North Slope and the cities where they maintain their households. In addition to shift change flights, supply flights would land at a field approximately every other day.

In addition to the wildlife disturbance from frequent air traffic below 1,000 feet (304 meters), an estimated 12 to 15 trucks per month would travel to and from the fields via roads connecting the Dalton Highway if oil flows east or to the coast above Kotzebue if oil flows west. These trucks could adversely affect wildlife.

C. Cumulative Development

Table III-4 displays other major North Slope fields which may be concurrently operating in the Arctic at the same time as NPR-A fields are producing (Shepard, et. al., 1982). Table III-5 compares the aggregate reserve estimates of these fields to a recent estimate by the U.S. Geological Survey. An export coal mine near Point Lay, the Cominco mine south of the Brooks Range, and the fields from Table III-4, considered to be cumulatively impacting the Arctic environment as NPR-A fields come into production.

T A B L E III-4

Distribution of Major North Slope Fields Other Than Prudhoe and Kuparuk

<u>Field Location *</u>	<u>Size in Barrels</u>
Beaufort Sea	3,565,000,000
Arctic National Wildlife Refuge	2,471,000,000
Beaufort Sea	2,348,000,000
Chukchi Sea	1,518,000,000
Beaufort Sea	1,377,000,000
Chukchi Sea	990,000,000
Beaufort Sea	839,000,000
Alaska Uplands East of NPR-A	802,000,000
NPR-A	543,850,000
NPR-A	543,850,000
NPR-A	335,300,000
Total*	15,333,000,000

* Several discoveries that have been made near Prudhoe Bay which may or may not represent economically recoverable fields not shown.

T A B L E III-5

U.S.G.S. Mean Recoverable Resource Estimates (Undiscovered North Slope Oil Reserves)

Arctic Coastal Plain	4,400,000,000
Northern Foothills	1,400,000,000
Southern Foothills/Brooks Range	201,000,000
Beaufort Near Shore	7,000,000,000
Beaufort Deeper Waters	800,000,000
Chukchi Near Shore	1,400,000,000
Chukchi Deeper Water	200,000,000
Totals	15,400,000,000

D. Oil Spill Risk and Response Analysis

CEQ regulations (40 CFR 1510) control the conduct of oil spill response operations as well as the control of hazardous substances. These regulations define the classification of discharge:

1. Minor events include discharges to the inland waters of less than 1000 gallons of oil or a discharge to the coastal waters of less than that defined as reportable by regulation (40 CFR Part 117).
2. Medium events are discharges of 1,000 to 10,000 gallons of oil to the inland waters; or a discharge of 10,000 gallons to 100,000 gallons of oil to the coastal waters; or a discharge of a hazardous substance equal to or greater than a reportable quantity as defined by regulations (40 CFR Part 117).
3. Major events are discharges of more than 10,000 gallons of oil to the inland waters; or more than 100,000 gallons of oil to the coastal waters; or a discharge of a hazardous substance that poses a substantial threat to the public health or welfare, or results in critical public concern.

Tables summarizing the anticipated number of NPR-A spills were prepared using the above classification system. Table III-6 lists the expected number of spills associated with field operation. Table III-7 lists spills along pipelines.

T A B L E III-6
Classification And Number of Anticipated Spills Within or Near Oilfields
(Source: Carufel, 1982)

<u>Classification of Oil Spills</u>	<u>Estimated Number of Spills</u>	<u>Volume Per Spill</u>
Minor Discharge	4,000	About 140 gallons
Medium Discharge	0	0
Major Discharge	0	0

T A B L E III-7
Pipeline Spills Associated with Delivery of NPR-A Crude
(Source: Carufel, 1982)

<u>Class of Incident</u>	<u>Number of Events</u>	<u>Volume Spilled (gallons)</u>	
		<u>Total</u>	<u>Average</u>
Minor	90 - 110	22,500 -27,500	250
Medium	35 - 40	143,500 -164,000	4,100
Major	15 - 20	945,000 -1,260,000	63,000

In areas of generally dry tundra (tussock, mixed meadow/tussock, or alpine tundra) a spill of 63,000 gallons of crude oil or refined petroleum products could be easily contained. The microtopographical relief of the tussocks would act to halt the spread of oil in the tussock and mixed meadow/tussock areas. The broken terrain in the alpine areas would similarly throw barriers in the way of spreading oil.

Spills on wet tundra, wet sedge meadows and on lakes could spread over large areas especially if wind driven. Similarly, summer spills on streams and rivers would quickly move downstream.

A spill of 63,000 gallons of crude oil or refined petroleum products could, based on previous studies of spill dynamics, spread over more than six miles of lake surface and/or travel the entire length of a river.

There is a probability of about .995 (about 995 chances in 1000) that at least one of the 15 spills along the pipeline would be in a wetland (Carufel, 1982). There is a probability of about .996 (996 chances in 1000) that there would be three or more spills in wetlands (or, assuming the economic life of the pipeline is about 30 years, that a wetlands spill would happen (on the average) once every ten years). There is a probability of .59 (about 590 chances in 1000) that there would be six or more spills in wetlands (or, on the average, one wetlands spill every five years). To some observers, one spill in every ten years in a wetland would meet their definition of frequent. To others, a spill in wetlands every five years would be frequent.

BLM has concluded, based on this analysis, that under the common sense usage of the word, spills in wetlands along the pipeline would occur frequently if there were commercial discoveries of oil found in, and produced from NPR-A.

In Alaska, the Department of Environmental Conservation of the State of Alaska has primary responsibility for assuring that spills are prevented, quickly contained and adequately cleaned up.

Federal interest in a spill does not cease when clean up is complete. If Federal resources such as wildlife, are damaged, then the government could seek damages. In addition the government would conduct thorough studies of the cause and the effects of the discharge to prevent future occurrences.

E. Induced Employment

In addition to the oil field construction and operation jobs discussed above, new jobs would be created in the Alaska economy in response to NPR-A development. These derivative, or induced, jobs fall into two categories; tax linked jobs and distributive jobs.

Tax linked jobs are supported by State and North Slope Borough government spending. State jobs result from property and severance tax collections and the State's share of the Federal royalties that are spent by operating agencies of the State. Construction jobs on such capital projects as roads, buildings, harbors, dams, etc. are another type of tax linked employment financed by the State out of its property, severance and royalty income. The North Slope Borough creates jobs when the Borough spends tax dollars it collect on oil field and related property.

Distributive jobs are in the trade and services sectors of the economy. These include jobs in real estate, finance, insurance, wholesale and retail trade, medicine, law, accounting, other professional services and recreation and leisure services. Distributive jobs would increase in response to household spending by project and tax linked workers. The oil firms or State and Borough governments real estate professional services and materials; also fuel growth in distributive employment.

To forecast the total effect on employment of any development, a forecast of project employment and tax linked employment must first be made. Then increases in distributive employment can be forecast. However, given the uncertainties surrounding future oil prices and State of Alaska Tax Policy, a forecast of tax linked employment would be speculative. In lieu of contracting for the preparation of such a forecast, BLM prepared an analysis of the relationship between estimated oil reserves and total estimated employment based on previous forecasts of the effects of Arctic Oil development (Table III-8).

T A B L E III-8
Peak Employment Effect Of
Other Forecasted North Slope
Developments*
(*Using the year 2000)

<u>Area Covered By Forecast</u>	<u>Estimated Recoverable Crude Oil</u> (Millions of Barrels)	<u>Statewide Employment Effect **</u> (Jobs)	<u>Employment to Reserves Ratio</u> (Jobs per Million Barrels of recoverable oil)
Beaufort Sea (high discovery)	1,900	18,696	9.84 jobs/million
Camden Canning	1,300	10,627	7.59 jobs/million
Cape Halkett	800	5,872	7.34 jobs/million

** Includes project, tax linked and distributive jobs.
(Source: Department of Interior, (1979))

Based on the estimate of 1,400 million barrels of recoverable NPR-A crude oil, development in the Reserve would add 10,200 (1,400 times 7.34) to 13,800 (1,400 times 9.84) total jobs in Alaska.

As peak direct project employment (Table III-3) was estimated at about 2000 jobs, included employment is implicitly set at 8,200 to 11,800 jobs.

III. IMPACT ANALYSIS FOR TYPE TWO VALUES

This impact analysis stops at the "could" or "may" happen point; that is, the analyst does not predict likely impacts but instead lists possible effects. The list of possible effects is based on a review of existing conflicts between oil and gas development and surface values of areas experiencing oil and gas

operations. Table III-9 lists these possible impacts. The fact that an impact is occurring or has occurred previously and thus is included in the analysis does not imply that it must occur in the future.

On the basis of this list of possible impacts, the DEIS analysts can identify mitigations which would eliminate "possible" impacts, or reduce them so substantially that the adverse effects would no longer be significant. Based on the list of possible impacts for moose, wolverine, shorebirds, ducks, whistling swans, wolves, Dall sheep and fisheries mitigations to eliminate or substantially reduce those impacts have been designed. Impacts and mitigations for these values are discussed below. The reader is cautioned that the selection and implementation of these stipulations in their present form is not guaranteed. The Alaska State Director will consider public response to this DEIS along with other available information in determining which stipulations should apply to NPR-A leases.

A. POSSIBLE IMPACTS

Impacts that may occur to these resources if they are exposed to oil development are discussed in this section.

1. Impacts to moose could include:

- ° The alteration or destruction of riparian habitat during gravel removal, or construction, of pads and road/pipeline rights-of-way;
- ° Road kills by ground transport;
- ° Interference with natural movements; and,
- ° Increased hunter access and increased harvest.

2. Impacts to shorebirds, ducks, and whistling swans could include:

- ° The alteration or destruction of molting, nesting and/or feeding habitat by proposed operations;
- ° Abandonment of critical habitat because of noise or other industrial disturbances;
- ° Depletion of energy during severe avoidance reaction when panicked by aircraft overflights or human disturbance; and
- ° Death due to coating, asphyxiation, poisoning and/or alteration of food supply from spills of oil or toxic wastes.

3. Impacts to Wolverine, Wolf, and Dall Sheep could include:

- ° Alteration of habitat during gravel removal or pad construction, facility placement or from road or pipeline rights-of-way which eliminate or influence prey species on which wolves or wolverine depend;
- ° Alteration of denning habitat or movement patterns for wolves and wolverine and mineral licks for Dall sheep during gravel removal, pad or facility construction or for pipeline or road rights-of-way;

T A B L E III-9

OVERVIEW OF POTENTIAL FISH AND WILDLIFE IMPACTS
(Adapted from State of Alaska 1982)

Activity	Potential Impact(s)
1) Seismic Exploration	Habitat abandonment due to habitat alterations and/or noise and disturbance; altered behavioral patterns; decreased reproductive success.
2) Site Preparation	Alteration or destruction of habitat; habitat abandonment; interference with migrations and natural movements. Alteration of natural drainage patterns; increased erosion and sedimentation; degradation of underlying permafrost.
3) Noise and Disturbance	Abandonment of critical habitats such as reproductive, feeding, and molting areas; altered behavioral patterns; decreased reproductive success.
4) Drilling Muds and Cuttings	Localized loss of habitat due to reserve pit construction; accidental contamination of adjacent waterbodies.
5) Oil Pollution	Death due to coating, asphyxiation, and poisoning; alteration of food web; interference with biochemical processes or behavioral patterns; sublethal effects such as reduced reproductive success, reduced resistance to disease, or increased stress;
6) Altering of Shorelines, Dredging and Filling of Wetlands, Gravel Removal, and Gravel Pad Construction	Destruction of habitat; alteration of natural drainage systems; water quality degradation; increased erosion potential; altered animal migrations or movements.
7) Discharge of Production Waters	If discharged into surface or subsurface waters, the following may occur; destruction of habitat interference with growth and reproduction; direct death due to poisoning; soil and groundwater contamination.
8) Water Withdrawal	Alteration of habitat; depression of ground and surface water table; entrainment of juvenile fish and other aquatic organisms.
9) Increase in Local Population and Changes in Access to Specific Areas	Avoidance of populated areas by wildlife; stress on wildlife from increased recreation activity.
10) Secondary Development (including roads and pipelines)	Loss or alteration of habitat; abandonment of critical habitats; interference with migration and natural movements.

- ° Malicious destruction of wolves and wolverines; and,
- ° Increased hunting pressure.

B. Proposed Stipulations

To reduce the possible impacts on moose, shorebirds, ducks, swans, wolves, wolverine, Dall sheep and other valued fish and wildlife resources, BLM proposes to adopt the following stipulations and procedural requirements prior to any future sale and to the permitting process. The proposed stipulation should be viewed as a formalization of the permit application process presently applied to all NPR-A permits requiring BLM approval or concurrence. The proposed stipulation procedural requirements can only be considered as "new" in the sense that they attempt to identify the permitting requirements for each tract prior to each sale.

1. Minimum Requirements

The applicant for any APD from MMS or other permit from BLM at a minimum will specifically identify and map all significant fish and wildlife use patterns within the vicinity of any proposed activity site. These surveys will be completed for all values and all tracts or areas so indicated in the BLM "Notice of Sale" preceding the applicable sale. The applicant will submit these maps as well as activity and site specific plans which illustrate the measures adopted by the applicant to reduce possible impacts on fish and wildlife resources.

These maps, plans and studies will serve as the basis for restricting facility siting and/or oil and gas activities and operations.

2. Optional Requirements

The Fairbanks DM, BLM, after consultation with BLM resource specialists, other regulatory agencies and/or the interested public may require further applicant studies of local and/or regional fish and wildlife ecology and sensitivities before approving or disapproving any BLM permit or before providing a response to MMS if these further studies are essential to a permitting decision in keeping with the public interest.

3. Exceptions

The DMM with the required concurrence of the Fairbanks DM, BLM or in the case of BLM permits, solely by the DM may grant written exceptions, available for public review upon request, for specific activities or facility siting when it can be shown by the applicant that such activities or facilities will not likely have an adverse effect on fish and wildlife resources or their preferred habitat. Exceptions for any permit must be specifically authorized in writing and must be separately reviewed during any permit renewal or amendment process. Exceptions will be granted only after an adequate written evaluation of the location, timing, intensity and density of the proposed operations as well as the anticipated cumulative effects of multi-company activities.

It is BLM's intent to utilize the proposed stipulation in the permitting process to assure adequate consideration of all fish and wildlife resources that may actually be impacted by a proposed project. It is not the BLM's intent to require any applicant to provide study results beyond that required for an informed and timely permitting decision. This policy is totally in keeping with the present requirements of the BLM permitting program.

C. Examples of Tract Specific Permitting Requirements

Tract specific permitting requirements that will be subjected to public review during the lease tract selection process and published in the formal BLM "Notice of Sale" preceding each NPR-A lease sale are as follows.

1. Gravel Stipulation

Gravel may be removed only from areas where a production rate to surface disturbance ratio of 5,000 or more cubic yards of gravel removed per acre of surface disturbed (9,450 cubic meters per hectare) can be maintained. Exceptions may be granted by the BLM Fairbanks District Manager if the applicant can show that the removal of gravel would not occur in active stream channels, would not lead to increased sedimentation of streams and would not permanently damage significant areas of fish and wildlife habitats.

2. General Stipulation for Moose Protection

All activities and temporary or permanent structures within one mile (1.6 kilometer) of high brush riparian habitats along the central Colville River and its tributaries between the Oolamnagavik and Anaktuvuk Rivers or other areas discovered to be valuable to moose during a permitting process will be designed to minimize alteration, destruction or encroachment on riparian high brush habitats found within the flood plain. The following activities within riparian high brush habitats will be approved only on a site specific, case-by-case basis after careful consideration of all alternatives which may be less damaging to moose habitat and use. They are tractor train trails, landing strips, seismic lines, sand/gravel removal sites that may damage the habitat and permanent structures, roads and pipelines that could block moose movement. For final permit approval, all activities and facilities within riparian high brush habitats important to moose must be designed to prevent restriction of moose movements in the area.

3. Stipulation for Whistling Swan, Duck and Shorebird Protection

All activities and structures on the Coastal Plain and shoreline of NPR-A will be designed to minimize alteration, destruction or encroachment on preferred waterbird and shorebird habitat in various classes of wetlands. (Plate Three in the back of this DEIS shows areas where this stipulation may apply.) Facility siting, surface entry, and fixed-wing aircraft flights below 500 vertical feet (150 meters) within one-quarter mile (400 meters) of preferred swan, duck or shorebird habitat during the snow-free season may be restricted if they are likely to have an adverse effect upon swans, ducks or shorebirds or their preferred habitat during the snow-free season.

In order to protect significant waterbird use (shorebirds, ducks, geese and/or whistling swans), there will be no permanent occupation or permanent alteration (that is, no gravel or sand mining) for the purposes of petroleum exploration,

drilling or other development activities of any designated NPR-A coastline, barrier island or salt marsh area. There will be no temporary occupation or permanent alteration (that is, no activity) of any designated NPR-A coastline, barrier island or salt marsh area between May 20 to August 25 of each year in order to protect significant waterbird nesting, molting and staging uses. These restrictions are to apply to all phases of oil and gas activities including maintenance and operation of producing wells. The "Designated Area" will be determined on a case-by-case basis on each permit granted for activities within these general areas. The term "Designated Area" is defined as the surface area required to protect ninety (90) percent of the waterbird nesting, molting or staging use occurring within six (6) miles of the proposed activity area from singular or cumulative disturbance.

4. Stipulation for Wolverine Protection

The applicants will submit site and activity specific plans for: eliminating possible attractions to wolverine such as improper garbage disposal, feeding by workers or any other human/wolverine interaction; for protecting known or subsequently discovered den sites, especially natal dens; and for protecting wolverine prey species. Further applicant studies may be required before approving or disapproving any permit. These ecological studies may include: winter food habits, delineation of home range, the importance of moose and caribou as prey, reproductive rate, mortality rate, and population levels and trends.

5. Stipulation for Wolf Protection

The applicant for any activity south of the Umiat Baseline will submit site and activity specific plans for: eliminating possible attractions to wolf such as improper garbage disposal, feeding by workers or any other human/wolverine interaction; protecting known or subsequently discovered den sites; and protecting wolf hunting areas and prey species. Further applicant studies of local wolf ecology or reaction to disturbance may be required. These ecological studies may include: effect on local wolves for any alteration in caribou movements, food habits, delineation of home range; the importance of moose and Dall sheep as alternate prey; reproductive and mortality rates; yearly movements patterns and population levels and trends.

6. Stipulation for Dall Sheep Protection

The applicant for any permit for any activity within the Brooks Range physiographic province of NPR-A will generally avoid and protect any Dall sheep habitat of any kind including summer range, winter range, lambing areas, mineral licks and movement corridors within the vicinity of the activity site. If there is any Dall sheep use within two miles (3.2 kilometers) of any activity site, the applicant will submit site and activity specific plans for eliminating parts of the activity that would alter, destroy or preclude use by Dall sheep.

7. Fisheries

A standard stipulation has been adopted for NPR-A fisheries. The BLM Alaska State Director has applied that stipulation to several tracts offered at the first two NPR-A sales. The thrust of that stipulation is:

- ° No activities, construction, or facilities will be authorized within 200 meters of Fish Creek, or any other stream or river which supports a subsistence fishery, unless the operator determines to the satisfaction of the Principal Federal Representative (PFR), who is the Deputy Minerals Manager, Onshore Field Operations, Minerals Management Service, Alaska Region that such activities, construction or facilities will not interfere with continued subsistence uses of these valuable streams.

The use of this standard practice during the future leasing program:

- ° Would through application of the 200 meter set back requirement of the subsistence stipulation attached to tracts along the Utukok, Koklik, Kuk, Inaru, Meade, Chipp and Ikpihpuk Rivers and on Fish Creek; substantially reduce impacts to fisheries and other values associated with rivers and streams by buffering the crude oil and fuels and lubricants away from the river or stream so that the numerous small spills associated with field operations could be contained before the stream would be contaminated.
- ° Would not eliminate the effects on fisheries of sedimentation from construction activities; loss of habitat in areas where crossing structures for roads and pipelines are placed in streams; alteration of the chemical balance of unfrozen water in winter which results from the depletion of that unfrozen water as water is drawn off for industrial use; and would not eliminate the possibility of a major spill of oil from a pipeline spreading over a lake or traveling the length of a river.

Residual impacts to fisheries would remain even with the application of the buffer concept. These residual impacts on fisheries would fall into several classes. Local and short term impacts on fisheries during the construction activities would lead to an increase in the sediment load of streams. Downstream from the construction activity these sediments could cover gravels which fish need for spawning and could, through alteration in the amount of light penetrating the water, alter the productivity of the stream for invertebrates, thus reducing the available supply of food for fish. Short term, local impacts would result if an oil spill from a pipeline entered a lake or stream and if the resulting loss of micro- and macroinvertebrates reduced the available supply of food for fish. Long term, local impacts would occur during winter if the drawing off of unfrozen water for field operations led to an increase in the concentration of toxic chemicals in the remaining unfrozen water. Long term impacts would also occur if field development and operations introduce chemicals into streams which altered the nutrient cycle either by depressing the stream productivity (chemicals toxic to micro or macroinvertebrates) or by introducing chemicals into the stream which combine with nitrogen or phosphorous in such a way that the limited nitrogen and phosphorous present in Arctic waters becomes less available in forms useable by living organisms.

D. Impacts To Soils, Air and Water Quality

The impact discussion below covers those adverse effects on soils and air and water quality which may accompany NPR-A development.

Soils: Extraction of gravel or sand for construction materials can result in increased potential for a wind and water erosion and a subsequent wearing down of the topography at a faster rate than in vegetated areas even if the material removal site is revegetated. Similarly, when a site is abandoned and pad materials are removed, the area where the pad was located may be subject to erosion as the pad would have destroyed the vegetation ground cover.

Air Quality: Emissions within NPR-A would be of a type similar to emissions at Prudhoe Bay. Table III-10 lists data on emissions from one drill site and one well pad at Prudhoe Bay. While a pad or drill site does not have an emission level high enough to breach national or state standards, emissions would be locally noticeable. There is anecdotal information from Inupiat villagers that wildlife, especially caribou, alter their distribution (disperse) during periods when local emission levels are high.

Water Quality: Several water quality changes could result from NPR-A exploration and development activities. Use of lake water and water from river pools during the winter would lead to further concentration of minerals in the remaining water with possible toxic effects on overwintering fish. The discharge of produced waters and/or the disposal of drilling muds and cuttings would introduce toxic chemicals into the aquatic environments. Oil spills would occur in wetlands with resulting degradation in water quality and loss of aquatic organisms. Culvert installation and road construction along with gravel removal would increase sediment action in active streams.

T A B L E III-10
MEASURED POLLUTANT LEVELS (mg/m3)
AT PRUDHOE BAY*, ALASKA

<u>Pollutant</u>	<u>Monitor Drill Site-9</u>	<u>Location Well Pad-A</u>	<u>Alaska DEC : Air Quality Standards</u>
<u>Nitrogen Dioxide</u>			
1 Hour Maximum	84.0	125.0	---
Annual Arith. Mean	3.5	4.0	100
<u>Ozone</u>			
1 Hour Maximum ++	113.0	113.0	235
Annual Arith. Mean	51.0	47.5	---
<u>Carbon Monoxide</u>			
1 Hour Maximum +	3430.0	3120.0	40,000
8 Hour Maximum +	946.0	856.0	10,000
Annual Arith. Mean	133.0	171.0	---
<u>Sulfur Dioxide</u>			
3 Hour Maximum +	13.0	25.3	1,300
24 Hour Maximum +	9.5	9.3	365
Annual Arith. Mean	0.4	0.5	80
<u>Total Suspended Particulates</u>			
24 Hour Maximum +	112.0	294.0	150
Annual Geo. Mean	6.7	11.4	60
<u>Non-Methane Hydrocarbons</u>			
6-9 AM Maximum**	263.0	163.0	160
Annual Arith. Mean	27.0	34.0	---

CHAPTER FOUR ENVIRONMENTAL CONSEQUENCES

I. IMPACTS TO BIOLOGICAL RESOURCES UNDER VARIOUS DEIS ALTERNATIVES

Type One Resources along with certain controversial issues (preservation of subsistence lifestyle; protection of the wild character of the Reserve) are to receive comprehensive EIS analysis. The discussion of how resources were classified into types is in Chapter One, page 7.

A comprehensive impact analysis provides, wherever possible, "would" statements as well and "could" (may happen) statements. "Would" statements are provided whenever:

- A credible case can be made that the described effect is likely; and
- The described effect would be significantly adverse.

The following discussions provide such comprehensive analyses for caribou, geese, polar bear, grizzly bear, peregrine falcon and other raptors. To provide a comprehensive analytical treatment for caribou and waterbirds, the BLM brought together a panel of scientists to estimate the adverse effects of oil and gas development on these key resources. Much of the alternative by alternative qualitative impact analysis which follows is drawn directly from the workshop (Gilliam and Lent, 1982).

A. Effects of Standard Requirements Leasing

When read together, the habitat protections and restrictions on worker activity resulting from implementation of the "standard" practices shown in Plate Nine in the back of this DEIS would:

- Limit alteration of caribou habitat within or near any area of oil and gas development operations and reduce the frequency and duration of worker/caribou contact.
- Minimize interference with the wanderings of bull, yearling or barren cow caribou when traveling individually or in small groups allowing these caribou at least the opportunity to habituate to non-threatening intrusions into their environment.
- Limit alteration of grizzly bear and polar bear habitats within or near any area of oil and gas development operations and reduce the frequency and duration of worker/bear contact.
- Generally reduce the impacts on geese that would result from most Coastal Plain developments to a level of unmeasurable regional significance and unmeasurable loss to the population level. Although a catastrophic oil spill or tundra fire reaching the Teshekpuk Lake Goose Molting Area (TLGMA) or completely destroying large areas of habitat for geese could result in significant impacts.

- Eliminate the impacts of oil development on peregrine falcon and reduce impacts to other raptors by assuring that no activities or facilities would be within one mile of peregrine falcon nest sites and by strictly controlling habitat alteration in areas peregrine falcons use for hunting. (Other raptors sharing peregrine falcon habitat would be benefited by peregrine falcon protections).

However, standard requirements leasing:

- Would not resolve the problems of stress, increased energy use, or delayed, deflected or blocked mass migrations of all caribou or alteration of the movements and habitat uses of pregnant cows or cows with calves because there is no clear indication that caribou would habituate, that is, become accustomed to disturbances. If caribou do not habituate then the development of fields and pipeline/haulroad corridors and associated high levels of human activity would act as an unnatural barrier to the mass migrations of caribou, especially the movements of pregnant cows and cows with calves during pre- and post-calving migration; and caribou would suffer physiological energy depleting avoidance responses to unexpected human intrusions such as low altitude aircraft operations.
- Would not insure that all grizzly bear denning habitat and home ranges influenced by the area of operations would be properly identified and all potential conflicts would be mitigated to avoid bear disturbance or attraction to the area of operations.
- Would not insure that all polar bear onshore maternity denning habitat and polar bear access routes influenced by the area of operations would be properly identified and all potential conflicts would be mitigated to avoid bear disturbance or attraction to the area of operations.
- Would not be effective in the area to the north and east of Teshekpuk Lake commonly referred to as the TLGMA.
- Would not be effective in protecting peregrine falcon and other raptors from indirect impacts of development triggered by the increased public access implied by new roads and airports in the Arctic.

1. No Surface Occupancy

No surface occupancy restrictions are considered a standard (BLM agency wide) requirement. The analysis of the no surface occupancy leasing option which follows is provided to determine if this standard practice would meaningfully reduce impacts.

Caribou: No surface occupancy leasing restrictions on most of the Reserve would have only limited benefit to caribou which utilize all of NPR-A as habitat. This alternative is viable only when discussing leases that lie in the pathway of major caribou migrations such as passes through the Brooks Range, traditional river crossings, or at the periphery of the TLH's Range. Selective use of this alternative would alleviate many potential barriers to migration. Indiscriminate application of this alternative without proper studies indicating whether it will be effective in the long-term will prove detrimental to caribou use and orderly and controlled petroleum development.

Use of no surface occupancy restrictions are presently recommended only for a portion of the TLH's range. (NSO-4 on Plate 4 in the back of this DEIS).

Grizzly Bear: As with caribou, indiscriminate application of no surface occupancy clauses in leases or permits to "cover-up" inadequate site and project specific baseline information in the long-term may become counter-productive to effective grizzly bear management. With respect to grizzly bear, no surface occupancy clauses would probably be both site and seasonally specific. Their effectiveness would be directly proportional to the adequacy of the baseline information gathered prior to the activity and facility siting permitting process. Application of no surface occupancy clauses within a lease to protect heavily used feeding or denning areas would reduce the chance of worker/bear confrontations and should be considered in application of design solutions.

Polar Bear: No surface occupancy clauses would not be an effective alternative without a better definition of traditional polar bear access routes and denning area. However, if combined with the knowledge required under the design solution stipulation, it may provide optimum protection if studies can define the basic compatibility level between development and polar bears.

Peregrine Falcon: A lease stipulation protecting existing peregrine falcon nest sites is a standard BLM practice. No surface occupancy within one mile of nest sites and essentially no temporary surface occupancy within two miles of a nest site from April 15 through August 31 is required. It may be prudent to avoid future facility siting problems by generally applying the one-mile no surface occupancy and two-mile seasonal restriction, or buffer zone, during the permitting process. Thereby, a one-mile seasonal buffer zone would be established for each bluff or cliff with active or historic nest sites. This would allow for nest sites to change their particular cliff face location without retroactively requiring alterations in a permittee's facilities or operations.

Other Raptors: It appears that other cliff-nesting raptors as well as the peregrine falcon would benefit from at least a minimal no surface occupancy stipulation if it were to be generally placed on all cliffs or bluffs providing raptor habitat. Not all historic peregrine falcon or other raptor nest sites are known. Therefore, it appears prudent to designate a flexible one mile no surface occupancy zone on each cliff in NPR-A suitable for raptor nesting.

Geese: All areas identified for no surface occupancy in Chapter Three (NSO's 1, 2, 3 and 5 on Plate 4) to protect sensitive areas for shorebirds and waterfowl are also recommended to protect use by geese. Protection of these coastal areas providing critical seasonal habitat will help insure that developments located in other areas of the Reserve will not result in significant impacts.

It must be stressed that no surface occupancy is interpreted as prohibiting all mining of sand and/or gravel from islands, spits or coastlines that provide goose or other waterbird habitat.

2. Impacts To Caribou Under Standard Requirements Leasing

Impacts on caribou habitat would result from any permanent development within the NPR-A. Whether the impact would be significant or even measurable in terms of effect on herd size would depend on the location of the development in relation to caribou use patterns and the caribou's as yet undetermined

ability to habituate (that is, to accommodate disturbance). Industrial developments within a calving area would almost certainly produce significant observable impacts while development at the edges of summer range might have only minor impacts that would not be measurable in terms of herd size. However, any NPR-A development would produce some level of residual impact on caribou habitat or access.

In May 1982, the BLM sponsored NPR-A Caribou Discussion Panel (CDP) met to consider the possible impacts on the Western Arctic Herd (WAH), the Teshekpuk Lake Herd (TLH) and the Central Arctic Herd (CAH) from possible oil and gas developments within NPR-A. The CDP qualitatively predicted expected impacts based on several hypothetical cases of development similar to those shown in Figures 11 through 14. These broad qualitative predictions about relative types and risks of impacts (Gilliam and Lent, 1982) are interwoven into this caribou impact analysis. However, the CDP could not quantify impacts or predict changes in the population demographics and distribution of the WAH, TLH and/or CAH.

The following discussions present qualitative and quantitative impact predictions, but only the qualitative predictions are backed by the CDP conclusions. The quantitative impact predictions have been constructed by the EIS team solely for this DEIS.

a. Upper Colville River Developments

Qualitative Analysis

The CDP analyzed the effects of fields along the Colville River between Umiat and Jubilee Creek in the Colville River headwaters (See Figure 11). This caribou impact analysis is labeled analytical case one. Their conclusions are:

- ° ... the habitats occupied by the two hypothetical fields, Liberator and Prince Creek, were identified as habitats receiving primarily short-term caribou use during periods of rapid movement... the direct loss of habitat due to displacement or decreased use of the fields themselves was considered insignificant...
- ° In terms of the probability that the...(road/pipeline) corridor would be a potential barrier, the likelihood is greatest with regard to the pre-calving movement...There is a 90 percent probability that 20 percent or more of the population would encounter the corridor at this time in a given year.
- ° The nearer the encounter occurred to the peak of the calving period... the more likely pregnant cows were to act in a highly sensitized fashion, as if they were cows with calves.
- ° ...encounters... associated with post-calving is viewed as the one most likely to have significant adverse impact...
- ° ...roughly 50 percent of the population, would be expected to encounter the long east-west segment of the corridor...

Quantitative Analysis

Summary of Hypothetical Impacts for Analytical Case #1.

- ° Disruption of the ideal demographics of the WAH would occur due to increased mortality of cows.
- ° Effect on WAH range would be desertion of all passes and ranges on the Arctic Slope east of Howard Pass and areas south of the corridor. There would be reduced subsistence availability of caribou to Anaktuvuk Pass.
- ° Effect on CAH range would be desertion of range south of the Umiat to the TAPS pipeline and reduced availability to subsistence users in Anaktuvuk Pass.

Simplifying Assumptions for Analytical Case #1

- ° Pregnant cows or cows with calves would not cross (would not habituate to) any corridor. (Other components of herd might cross corridor).
- ° Fifty percent of the pregnant cows or cows with calves would encounter the corridor each year in the precalving migration and have to travel around the corridor and Liberator field equal to a 42 percent greater travel distance. (Forty-two percent greater travel distance was computed from the difference of straight line distance from Howard Pass to calving grounds versus the deflected distance).
- ° As a group, pregnant cows and cows with calves are assumed always to be at energy equilibrium. Deflection from straight-line travel will push some animals to exhaustion and death. The percentage of cows lethally affected is assumed to be directly proportional to additional migration time: that is, a one percent increase in migration time implies a one percent increase in cow mortality. In this analysis, the death of a cow with a calf also means the death of the calf.

Discussion for Analytical Case #1

The case #1 analysis predicts that the demographics of the WAH would be adversely affected every year they continue to use Brooks Range Passes east of Howard Pass. While population numbers would not be measurably altered in the short term, any increase in the mortality rate of cows lowers the long term reproductive potential of the herd. It is also predicted that the WAH would adapt to the intrusion of development by abandonment of range east of a line drawn from Howard Pass to the hypothetical Liberator Field and south of the illustrative corridor.

In a herd of 180,000 caribou, it is assumed there would be about 100,000 cows. Fifty percent of these cows, or 50,000 cows would encounter a pipeline and road from the Liberator Field in the precalving migration. Normally, 75 percent of these cows, or about 37,500 cows, would be pregnant and would approach the pipeline in an energy depleted and life threatened state. As mentioned above, these cows could experience a delay of as much as 42 percent greater travel time in reaching the Utukok Core Calving Area as they circuitously avoided the pipeline and road. It is reasonable to conclude that this delay would result in a higher than normal mortality rate for these cows. The normal annual mortality rate for these cows is six percent (.06).

Assuming that this mortality rate would increase linearly and proportionately with travel time, then a 42 percent delay in travel time would lead to a mortality rate of .0852 (.06 normal rate times 1.42). The 37,500 cows which confront case #1, at a mortality rate of .0852, would experience predicted annual death losses of 3,195 cows. The 62,500 cows which continued to experience a normal mortality rate of .06 would have an annual average loss of 3,750 cows. The total annual average mortality for both groups would be 6,945 cows, or 945 cows above the predevelopment level. Before development the 100,000 cows, at a death rate for all cows of .06, would experience an annual average loss of 6,000 cows. Additional increases in cow mortality rate could also be possible in the postcalving and fall migrations.

Perhaps even more significant than an alteration of WAH demographics is the possible desertion of a portion of the traditional range. This would prevent the WAH from achieving its highest potential population because the habitat available would become a limiting factor much sooner. There is a high probability that the CAH also would desert the portion of their range to the south of the Umiat to TAPS pipeline. This would leave subsistence harvesters in Anaktuvuk Pass and other villages with two choices: to adapt to harvest of the few stragglers still using the area, or to travel a greater distance to obtain caribou.

Several events could occur to dampen the significance of impacts. Herd management measures could be undertaken to prevent this worst case scenario from resulting in an even greater change in demographics. Range abandonment could occur at a brisker pace lowering the overall loss of reproductive potential—percent due to an abundance of bulls. Greater numbers of caribou could become resident on the Coastal Plain moving to and from the calving grounds without approaching the corridor. The State could require bulls only hunting restrictions that possibly could lower the background mortality rate for cows and yearlings to five percent. Finally, the caribou may habituate to NPR-A developments.

b. Teshekpuk Lake Developments

Qualitative Analysis

The CDP analysis of the effects of several fields on the Coastal Plain surrounding Teshekpuk Lake (see Figure 12) concludes that:

- ° For the WAH, developments in the Coastal Plain of NPR-A... would have... relatively little impact... There is no evidence that winter range here is limited, as to present a problem even if access was significantly reduced.
- ° ...a field in the vicinity of the Smith River location would...(be in) ...as much as 20 percent of the calving area of the TLH... This compares with about 5 percent of the calving area of the CAH... so occupied by... oil field developments.
- ° ...lack of separation of seasonal (TLH) ranges...could mean that habituation would be more likely or it could lead to more drastic impacts because of simultaneous effects at more than one point in their annual cycle.

- ° ...Because of the apparent nature of movements of this herd centering around the lake, there is an unusual potential for disruption of patterns.

Quantitative Analysis

Summary of Hypothetical Impacts for Analytical Case #2.

- ° WAH - There would be loss of access to an insignificant portion of winter range (amount of winter range is not considered presently limiting to WAH). Loss of access to habitats offering relief from insects on a portion of the coast would have an unmeasurable significance unless the access is also limited to other NPR-A coastal areas.
- ° TLH - There would be loss of herd identity by merging and moving with the WAH with an abandonment of caribou habitat around Teshekpuk Lake. This loss of TLH identity would be of scientific and subsistence significance but probably insignificant to maintenance of total Arctic caribou population levels.
- ° CAH - The extension of the present Prudhoe Bay - Kuparuk haulroad into NPR-A may become highly significant. The CAH's pregnant cows and cows with calves would lose unhindered access to the area north of this road, including the CAH's main calving area. Loss of CAH identity by merging with the WAH or partial abandonment of range with reduced CAH population levels would result.

Simplifying Assumptions for Analytical Case #2.

Pregnant cows or cows with calves would not cross or inhabit (would not habituate to) any development field or corridor. Other components of the herd may inhabit the edges of fields in small groups to obtain browse or relief from insects.

Discussion for Analytical Case #2

The identity of the 4,000 - 5,000 members of the TLH has only been recognized by biologists in the last four to five years, although residents of the North Slope Borough have long known of a resident population in the Teshekpuk Lake area. It appears that year-round residency of caribou in this area may be some type of adaptation of a few caribou during the low point of the WAH's population level in the 1970's. As the WAH population level continues to expand from the estimated population of 180,000 in 1982, its overwintering members on the Coastal Plain may either expand the size of the TLH if a separate calving ground is maintained, or encompass the TLH if all calving in the Teshekpuk Lake area stops. This analysis indicates that the latter result would occur if development begins as projected in case #2.

This analysis assumes that caribou cannot tolerate more than peripheral occupation of a calving grounds. A field in the vicinity of the Smith River would occupy about 20 percent of the recently used calving grounds of the TLH. When considering the example of the highly sensitized behavior of the CAH on their calving ground to the east, which is only five percent occupied by oil development, it is probable that TLH caribou would simply abandon the disturbance area and join the WAH Coastal Plain wintering population and shift calving to the northern

portions of the Utukok Uplands. Some caribou use of the edges of fields and corridors would be evident in all seasons but the identity of the TLH would be lost.

The development of a haulroad/pipeline corridor connecting the Prudhoe Bay - Kuparuk developments to northeastern NPR-A would have several adverse impacts on the CAH. CAH access to their core calving area north of the Kuparuk field would be changed requiring the caribou to cross the corridor. Establishment of a new calving area in a less than optimal habitat south of the traditional calving area is also a possibility. Access to areas providing relief from insects along the Beaufort Sea coast would be altered. A coastal road/pipeline corridor is already planned from Prudhoe Bay to Duck Island to the east of the Prudhoe Bay complex and it is probable that this corridor would restrict access to the coast for insect relief to the east of TAPS. A Kuparuk road extension to NPR-A would compound this impact by eliminating coastal access west of the TAPS. Faced with these developments, the analysis projects a reduction in CAH size and range due to loss of unrestricted access to the optimal calving area. There is a slight possibility that CAH herd identity would be lost to the WAH or Porcupine herds with only a few individuals using the old CAH range without a distinctive calving area.

c. Utukok River Area Developments

Qualitative Analysis

The CDP looked at fields in the Utukok River area, including a pipeline to TAPS (Figure 13) and concluded that:

- ° (This combination) ...would result in an east-west corridor dividing NPR-A, as well as the range of the WAH, into two portions.
- ° ...Roughly 150 square miles of the 1,100 square mile core calving area would be subject to occupancy (by development) and at least partial displacement of those caribou that normally use it...
- ° ...there is a probability of over 90 percent that almost all adult females in the population would be in or encounter the fields at least once immediately before, during or after giving birth...Overall, the effect will be to alter the movements and distribution of cows and associated caribou over the calving grounds...
- ° In terms of effects on individuals, a cow entering and persisting in using a field would:
 1. Still be able to locate optimum forage, unless she was prevented from leaving the field after calving.
 2. Be subject to levels of disturbance above normal "background" levels.
 3. Spend less than a "typical" proportion of time feeding.
 4. Find localized movements restricted and time consuming.
 5. Be subject to traffic and other accidental forms of mortality at above-normal levels.

6. Be more likely to abandon or be separated from neonate calf.
 7. Be subject to somewhat less-than-normal chances for predation-related mortality.
- ° Those that were displaced or deflected by a field would be placed in a less-than-optimum calving environment than they would have been and would share this environment at a higher-than-normal density.
 - ° ...These encounters could involve thousands of cows with calves under one week old, an age when their capacity to negotiate barriers, relocate their mothers and recognize potentially dangerous objects or situations is still extremely limited.
 - ° ...there is the distinct possibility that the fields and corridor could cause a split with coastal wintering cows staying north and east, and the southern wintering ones staying south and east of the corridor. The long-term consequences of such an event are highly unpredictable, but the movements and identity of the herd could be altered.
 - ° There was complete agreement that the calving period was the time in the annual cycle when habituation to disturbing stimuli was least likely to occur among cows...
 - ° ... a cow could encounter various developed areas and potential barriers seven or eight times in a year... The majority of these encounters would be during the calving, post-calving and summer periods considered most sensitive...

Quantitative Analysis

Summary of Hypothetical Impacts for Analytical Case #3

- ° The WAH would be split into two herds. A northern WAH would be resident year-round on the NPR-A Coastal Plain and northern Foothills. The initial population size would be approximately 40 percent or less of the old WAH. Low predation rates, variable hunting pressure and use of the same habitat year-round would make this NWAH highly susceptible to a "boom and bust" cycle of over-population and overuse of habitat. This would lead to a population crash and slow regrowth with many ramifications for coastal subsistence hunters. Calving for this herd would center in the northern part of the Utukok calving area. Interchange of individuals with the southern WAH would still be possible during the calving period. A southern WAH would remain migratory but as indicated in analysis #1, the portion of the range east of Howard Pass and south of the corridor would be gradually abandoned by pregnant cows and cows with calves and the segment of other herd individuals associated with them. Initial population size of the SWAH would be approximately 60 percent or more of the old WAH. High predation rates by wolf packs protected by the establishment of National Park Service lands on the south side of the Brooks Range would be evident. The change in the geographic distribution by abandonment of the eastern NPR-A habitats, changes in subsistence hunting availability and loss of use of portions of calving area and summer range in NPR-A would reduce the maximum obtainable population for this herd. Because of

the multitude of factors influencing the size of the SWAH, it could become stabilized after several years at a much lower level than that of the old WAH.

Overall, the combined populations of the NWAH and SWAH would never reach the maximum potential of an unrestricted WAH. Intensive game management of the sedentary NWAH may be necessary to prevent initiation of a "boom and bust" cycle. However, due to the migratory nature of the SWAH, intensive game management might have little success in maintaining the size of the SWAH. Moderate to severe decline of up to 50 percent is probable in maximum obtainable population of the original WAH.

- ° The TLH would sustain a loss of herd identity by merging with the NWAH as predicted for analytical case two. The calving area north of Teshekpuk Lake could remain in use.

Simplifying Assumptions for Analytical Case #3

- ° Pregnant cows or cows with calves would not cross or inhabit (would not habituate to) any development field or corridor. Other components of the herd may inhabit the edges of fields in small groups to obtain browse or relief from insects.

Discussion for Analytical Case #3

Fields within the Utukok Uplands would produce the most significant impacts on caribou populations on or adjacent to NPR-A. The CDP made no quantitative predictions of impacts but determined that an east-west corridor dividing the Reserve into north and south ranges would result in a change in WAH distribution and identity. This analysis predicts that the WAH's sustainable population would be reduced.

Splitting the WAH into two smaller segments that even with combined populations would never equal the population potential of an unrestricted WAH is the logical outcome of case #3. Presently, up to 40 percent of the WAH winters on the Coastal Plain. It is assumed that the starting populations of the NWAH would be 40 percent of year one's population (the year the corridor is finally finished and in use with no unfinished road gaps). The SWAH would be 60 percent of year one's population.

In the case of the NWAH, absence of predation by wolf packs and grizzly bears could result in a rapid growth of the herd. The NWAH, which would not be exposed to long energy-consuming migrations, would outstrip the ability of the Coastal Plain to support an increasing population. Eventually, a population crash would result. Recovery from the population low and overuse of available habitat would be aggravated by recruitment of individuals from the SWAH following the calving period when both herds would calve in the Utukok Uplands separated by the Avingak/Utukok hypothetical development field and corridor. This recruitment from the SWAH would slow the NWAH's stabilization due to continued overuse of habitat.

In the case of the SWAH, the caribou would be subjected to a higher percentage of population loss to wolf and grizzly bear predation because the SWAH would always remain within the range of these two predators. Although grizzly bears have never been considered a prime predator on the WAH, restriction of the

SWAH to the southern part of the "core calving area" on NPR-A would make available a great deal of prey, including neonatal calves, within the most densely inhabited grizzly bear range on the Arctic Slope.

The SWAH could not readily move away from bear predation without accompanying loss of use of optimum calving area and calving success. Abandonment of the more easterly portions of the traditional WAH winter and migratory habitat would result from the development of Liberator field and the east-west corridor as discussed in analytical case #1. Overall, the SWAH would probably stabilize at a level below the carrying capacity of the available range.

The TLH probably either would be expanded by the NWAH or lose its identity to the NWAH under this hypothetical case. Overuse of the present TLH habitat by expanding the number of resident caribou on the Coastal Plain is a possibility. This type of habitat overuse could make calving north of Teshekpuk Lake untenable with a shift of all calving for Coastal Plain resident caribou to the northern portion of the Utukok Uplands.

The impacts experienced by the CAH would be as described for Analytical Case #1.

d. Western NPR-A Discoveries

Qualitative Analysis

The CDP reviewed the effects of a road and pipeline going west to the vicinity of Cape Thompson from a series of fields in the Utukok Uplands, the upper Colville River drainage and near Peard Bay (Figure 14). The CDP concluded that:

- ° fields ...developed in the calving grounds ...were determined to involve extremely high risk of unacceptable environmental impacts..."
- ° The impacts on the caribou population resulting from corridor effects in this case are relatively minor compared to the field impacts. However, the western corridor may influence herd behavior in such a way as to decrease availability for subsistence use in villages such as Point Hope, Wainwright and Kivalina.

Quantitative Analysis

Summary of Hypothetical Impacts for Analytical Case #4

- ° A moderate to severe decline (up to 50 percent) in presently attainable WAH population could result from abandonment of range to the north and west of the corridor and the presence of fields in the calving area. A split in the use of the calving area could occur with the majority of cows using Brooks Range passes to the east of Howard Pass to reach what would be the new main calving area to the north and east of the present core calving area. Establishment of new satellite calving areas to the southwest of the corridor and in previously used areas in the vicinity of the Meade and Awuna rivers headwaters would occur. Elimination of the westerly post-calving movements observed in some years would occur. Fall migration and the return to wintering grounds would be almost exclusively via Howard Pass or more easterly passes. Because of the split in availa-

bility of calving grounds, there would be an increased tendency for some of the WAH to remain on the Coastal Plain in winter. Within this area the carrying capacity would not be overused.

- ° There would be little effect on the TLH other than increased recruitment to and from the Coastal Plain wintering segment of the WAH.
- ° There would be no measurable effect on the CAH.

Simplifying Assumptions for Analytical Case #4

The DEIS preparers assumed that pregnant cows or cows with calves would not habituate to any development field or corridor. Other components of herd may inhabit the periphery of a field in small groups to obtain browse or relief from insects.

Discussion for Analytical Case #4

Loss of caribou calving habitat and access to areas west and north of the corridor would result in a corresponding decrease in the maximum attainable WAH size. Effective exclusion of caribou from post-calving habitat southwest of the calving grounds would greatly reduce caribou availability for subsistence users in Wainwright, Point Hope and Kivalina. The season of availability to villages in the lower Noatak and Kobuk drainages would be shortened by a tendency for the WAH to migrate through Howard Pass or other more easterly passes.

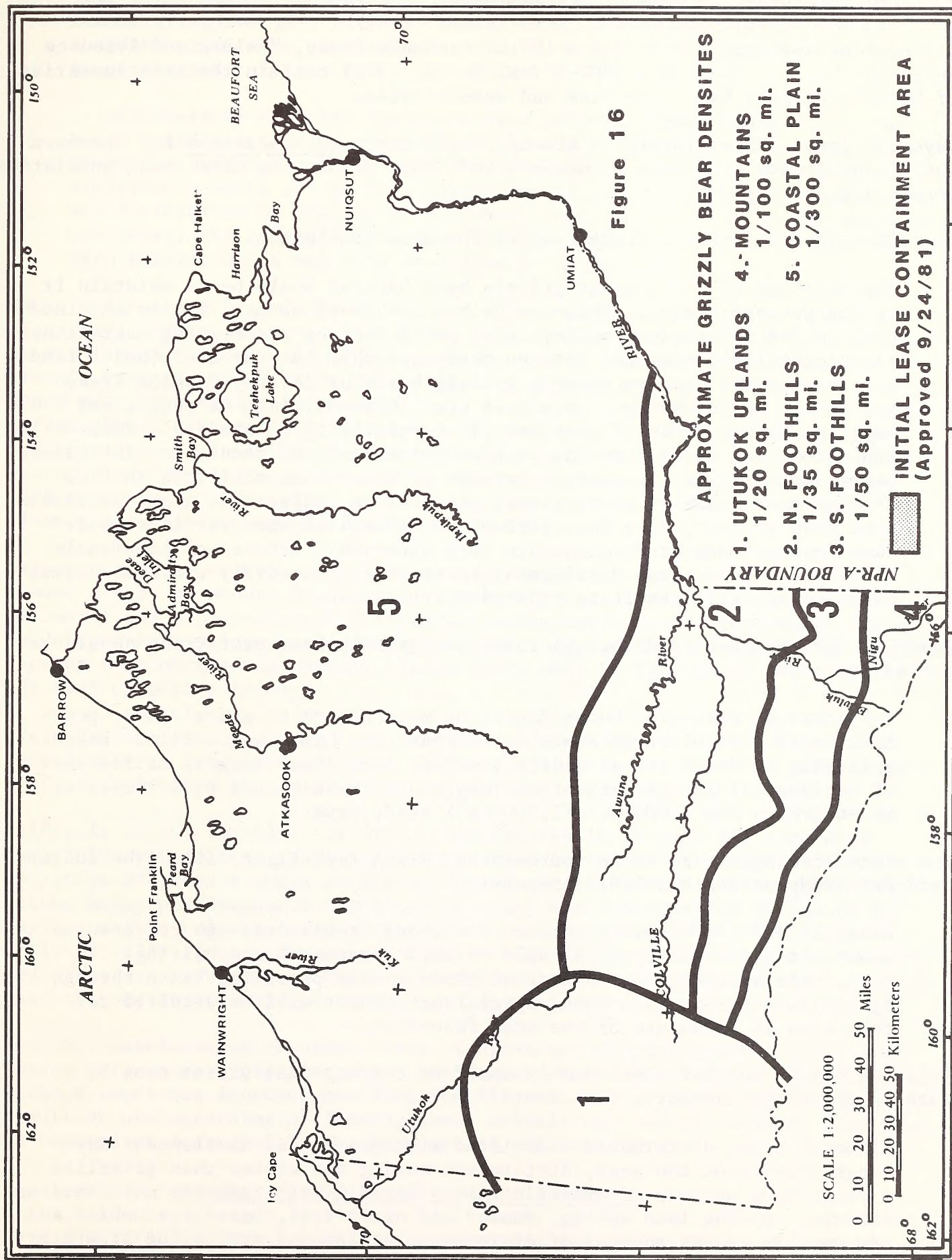
There is a distinct possibility that some mortality of cows and calves would occur due to occupation of the calving grounds. Total population level changes may not be measurable but disruptions in WAH demographics would have long-term effects on overall optimum size for the herd.

The shift in accessibility of portions of the calving grounds could have profound influences on WAH distribution. The area to the north of the Avingak/Utukok fields is the logical successor to the "original" core calving area as it represents the largest and most accessible remanent of this habitat type.

The bulk of WAH caribou would probably calve here at a high population density rate because caribou would be effectively protected from wolf or grizzly predation by the predators' sensitivity to human activities to the south.

Ease of access to this area would influence a large proportion of the WAH to remain on NPR-A during winter thereby reducing the availability to subsistence users outside of NPR-A.

Cows from the WAH that wintered south of the Brooks Range would use less than optimal areas for calving due to the long avoidance distance that would have to be traveled to reach the remanent core calving area to the north and east of the corridor and fields. Calving in less than optimal areas would result in less than optimal calf survival. Predation by wolves and grizzly bears would be a factor in overall cow/calf survival rates. If the same WAH animals utilize these areas for calving every year, the demographics of these populations may be altered from the optimal sex and age class ratios. The long-term effects on overall WAH productivity would lead to an unmeasurable or slight long-term decline in the presently "naturally" attainable population.



2. Comprehensive Analysis of Grizzly Bear

A report by Reynolds (1979) and a 105(c) Land Use Study, "Values and Resource Analysis" Vol. 3, Section 6 (NPR-A Task Force, 1978) contain the best summaries of NPR-A's grizzly bear resources and sensitivities.

Reynolds says: "The history of brown/grizzly bears (Ursus arctos L.) has been one of continuous reduction of numbers and range coinciding with human population growth and development."

The NPR-A 105(c) Land Use Study reached the same conclusion:

The best use of the present grizzly bear habitat would be to maintain it in its present status. This can be best achieved by prohibiting any land uses in the major river valleys that would destroy the feeding habitat or restrict grizzly movement between drainages when in search of food. Land uses that would disturb denning grizzly bears or destroy denning areas would also be in conflict with best use. Concentration of people and solid wastes in areas of bear use is especially to be avoided. Such concentrations often from 'attractive nuisances' and result in habituated bears that are shot or removed because of human-bear conflicts (Milke, 1977). Historically, grizzly bear populations, especially when associated with open terrain, have been reduced or extirpated wherever increased human populations or developments have occurred. Because of inevitable human/bear encounters, development in an area effectively excludes normal bear use and will result in reduced overall numbers.

Reynolds further concluded that enclaves for grizzly bear protection should be set aside:

The greatest potential human impact on maintenance of grizzly bear populations is that of large-scale development and human habitation. Because grizzlies in NPR-A travel widely and have large home ranges, maintenance of enclaves of intact habitat is important; these should be at least as extensive as the 2,000-mi² (5,000-km²) study area.

The study area mentioned is in southwestern NPR-A (see Figure 16). The 105(c) Land Use Study strengthens this proposal:

Bears in the high density area of the upper Utukok drainage referred to above are particularly vulnerable to both harassment and hunting. In turn, this area may be a center of productivity providing bears through egress to other areas. Thus, special management will be required for this area if human use of the area increases.

Reynolds (1979) further concluded it would be crucial that winter dens be identified and protected:

Although human disturbance associated with gas or oil development may occur throughout the year, disturbance during the winter when grizzlies undergo long periods of winter dormancy would likely have the most serious effects. During late spring, summer and early fall, bears are mobile and can usually escape sources of disturbance but during the period of winter denning, disturbance which was serious enough to cause bears to leave

dens could result in poor physical condition or death. Also, since female grizzlies give birth in winter dens, disturbance could cause abandonment of dens, resulting in the death of young exposed to winter temperatures.

...observations of other den sites near seismic lines indicate that no bears abandoned dens because of seismic explosions; however, bears were disturbed enough to shift their position inside the dens. While such disturbance would not be detrimental to the majority of bears, agitation and disturbance of females with newborn cubs could result in the death of the young; the possibility is not likely, but it could occur, especially with females which are very sensitive to disturbance.

While present BLM stipulations call for: "No seismic shooting or vehicle operations within one-half mile of any denning barren ground grizzly..." they do not include any specific requirement to locate any dens other than those already known to BLM. While this stipulation may have been sufficient for NPR-A petroleum exploratory activities, it may not be sufficient for the more intense NPR-A oil activities expected if fields are developed. No special concentration areas for denning were found in studies of the grizzly bear in southwestern NPR-A (Reynolds, 1979). Therefore, without required intensive site specific surveys before an activity takes place, it may be impossible to attempt to minimize impacts from nearby activities.

Experience from developments elsewhere in Alaska has shown that two other issues are of paramount importance: intentional or inadvertent harassment of bears; and maintenance of "attractive nuisances" such as feeding of bears by workers and by improper garbage disposal. Aggressive bears or bears which show no fear of man may result. These bears must be removed or shot in the interest of public safety.

Every Arctic development has restrictions on human/bear interactions, but enforcement to date has been lax. Milke (1977) provides the best general case study and the best suggestions for regulations stressing enforcement.

Oilfields in the foothills of NPR-A (see Figures 11 through 14) have been chosen for comprehensive analysis. This case intersects the highest known densities of grizzly bears on NPR-A. Developments outside the Foothills and Brooks Range physiographic provinces of NPR-A are not expected to result in any measurable reductions in grizzly bear numbers due to their low distribution density (1 per 300 square miles). Coastal Plain development encounters and conflicts with grizzly bears are expected to be so infrequent that case-by-case circumstances would be adequate to determine proper mitigations.

However, developments in other areas of NPR-A may attract grizzly bears that wander into an activity area while feeding or when curious about the smells of garbage receiving improper handling and disposal. Worker/bear encounters as a result of photographing or feeding these animals may result in bears that must be removed or destroyed in the interest of public safety.

Summary of Hypothetical Grizzly Impacts

In a conservative impact modeling, a permanent loss of up to 15 percent of NPR-A's sustainable grizzly bear population due to displacement from preferred

habitat and of individuals to insure public safety is expected over the 35 year life of the model.

Discussion of Comprehensive Analysis

The 400 to 450 grizzly bears estimated to be resident on NPR-A represent a resource that would be slow to recover from a sustained population loss. Loss of individual bears in relationship to oil and gas development would take two forms:

- ° Displacement of bears from a habitat in an area already at carrying capacity, effectively insures the death of some bears via intraspecies competition for resources in adjacent habitats.
- ° Worker confrontation with hostile bears often leads to destruction of the bear to insure public safety.

It is assumed that there is a direct relationship between the amount of surface encompassed by fields and the number of grizzly bears that would be lethally displaced. This relationship can be expressed as:

Area(s) of Altered Habitat (times) Average Grizzly Bear Density

Using this equation, the estimated permanent loss of population due to field developments equals:

Avingak Field = 60 square miles X .05 bear per square mile = 3 bears

Utukok Field = 80 square miles X .05 bear per square mile = 4 bears

Liberator Field = 80 sq. mi. X $\frac{.029 + .02}{2}$ bear per sq. mi. = 1.88 bears

Prince CK = 80 square miles X .0033 bear per square mile = 0.26 bears

This would equal a total of about nine bears lost from the total sustainable NPR-A grizzly population due to displacement.

Estimating worker/bear encounters lethal to the bear is more difficult. Most lethal encounters would occur in proximity to worker residential enclaves at oil fields and at pump stations on a pipeline. Encounters along the haulroad would probably be more frequent but less threatening because workers would be instructed to leave the area.

It is assumed that worker/bear encounters at Prince Creek field are so infrequent that only five encounters lethal to the bear would occur in the 35 year project life including all encounters at pump stations downline of Prince Creek. This low rate of bear destruction would probably be unmeasurable but it is assumed that one individual would be lost to the NPR-A sustainable population after 35 years.

At Liberator Field, encounters with bears because of higher densities would be seven times more common than at Prince Creek. As many as 35 worker/bear encounters fatal to the bear are anticipated. Proportionately, seven bears are lost to the NPR-A sustainable population after 35 years.

At Avingak and Utukok Fields, worker/bear encounters lethal to the bear would be fifteen times as common as at Prince Creek because of the relatively high density of grizzly bears near the WAH's calving grounds. There would be an estimated 150 encounters fatal to the bear in 34 years and 30 bears would be lost to the NPR-A sustainable population if fields were developed in the Utukok Uplands.

In summary, the analysis predicts (as shown in Table IV-I) reductions in presently sustainable grizzly populations during the life of oil and gas operations (assumed to be 35 years).

Table IV-1 Predicted Reduction in Sustainable Grizzly Bear Populations

Displacement of Grizzly Bears from All Fields	=	9
Loss to NPR-A Sustainable Population after 35 years		
Prince Creek	=	1
Liberator	=	7
Avingak Creek	=	15
Utukok River	=	15
		<hr/>
Total		47

Therefore a reduction in the grizzly bear population equaling 47 bears, equivalent to a 10 to 11 percent decline in NPR-A population over 35 years due to the presence and activity of development is expected in this analysis. This conservative estimate of decline does not take into account any indirect impacts upon sustainable grizzly bear populations due to changes in numbers and/or distribution of caribou due to development. Based on the analysis of this same scenario for caribou, the grizzly population may be separated from 40 percent of the WAH by the road/pipeline corridor if fields are developed as shown in Figure 13. Although grizzlies do not appear to be hesitant to cross corridors in the absence of intense human activity, the bears would lose carrying capacity in direct correlation to any decrease in access to caribou prey.

3. Comprehensive Analysis of Polar Bear

Information on polar bear use of onshore habitats on NPR-A is limited. Available data are summarized in two reports: Benfield (1979) and the 105(c) Land Use Study, "Values and Resource Analysis" Vol. 3, Section 6 (NPR-A Task Force, 1978). Use of terrestrial habitats in NPR-A is limited to the period from October through April when pregnant females may leave the offshore environment to seek out onland denning sites. Areas chosen for den sites generally are within about 20 miles from the coastline (Figure 6).

The 105(c) Land Use Study states:

The principal 'change agents' influencing on-land denning habitat are the activities of humans in the coastal zone during winter months. Currently increasing human activity and developments in the coastal zone, including surface travel, construction of temporary and permanent camps, and the removal of snow for human use, will lead to loss of on-land denning habitat or could interfere with freedom of movement to or from these denning areas.

The 105(c) Land Use Study concluded that the best means of preserving polar bear and their habitat was:

...to maintain it in its present status. Any increase in human activities during the winter months (October - April) or increases in permanent developments in the coastal zone, including those activities that would alter the surface topography so as to reduce the availability of suitable snowdrifts for denning purposes, can potentially deter female polar bears from coming on shore to den or interfere with their return with young cubs to the sea ice in the spring. Camps and their associated solid waste can constitute an attraction leading to human/bear conflicts. Removal of snow from drifts for roads, pads, and water supplies can destroy or make unsuitable the same snowdrifts that are most desirable for bear denning sites. At this time no opportunities exist for increasing polar bear habitat. Phasing of coastal development to restrict activities to limited segments of the coastline at any given time is recommended...

In terms of this DEIS analytical case, case #2 (Figure 12) provides an interesting model. It may be possible to design other hypothetical analyses using arbitrary average denning densities and arbitrarily identifying access routes. Unfortunately, the analysis would be of marginal value because the significance of any resulting impacts and the probability of occurrence would be unpredictable given the many unknown variables which could affect the outcome. Therefore, the following residual impact analysis is presented.

It is recognized that some reduction in onland polar bear maternity denning would occur through habitat alteration or loss of access resulting from oil and gas development. However, it is not likely that any significant change in polar bear demographics would occur because:

- ° Although the average density of such onland denning is unknown, any field or complex of fields would likely affect a limited number of potential sites; and
- ° It is not known if such onland denning is only facultative (desireable) or if it is critical habitat use that limits polar bear populations. If polar bear can shift their pattern of use, then the loss of potential maternal denning sites would not be a significant problematic.

Unlike grizzly bears, polar bears do not defend a defined home range. It is possible that if onland denning could occur in any suitable habitat beyond the influence of development, there would be no conflict as the female would simply choose another site. It is also possible that a particular female may have an area preference based on past use. Assuming the latter case, population productivity may be reduced. Without better baseline data to estimate from, the amount of reduction and its significance is unclear.

It is reasonable to assume that oil development would lead to an inevitable attraction of a small number of polar bears to human activity sites. How many of these human/bear encounters would be lethal to the bear because of concern for public safety is unknown but some will occur.

In summary, the residual impacts based on the standard requirements could be: a possible loss in population productivity with all attempts at onland denning in the vicinity of the developments within the denning area ceasing due to range abandonment; and a long-term loss of a few bears destroyed in the interest of public safety.

4. Comprehensive Analysis of Geese

Migratory waterbird ecology on NPR-A has received few intensive studies. Most studies have been limited to either aerial surveys (King, 1979) or intensive site-specific studies at a few scattered locations within the Reserve (Derksen, Rothe and Eldridge, 1981).

Because there is limited published waterbird data for NPR-A, a "Waterbird Discussion Panel" (WDP) was formed in May, 1982 as a part of the "NPR-A Caribou/Waterbird Impact Analysis Workshop" (Gilliam and Lent, 1982).

The panel recommendations have been used throughout this DEIS. Areas recommended by the panel for no surface occupancy leasing to protect significant shorebird and waterfowl habitats are shown as NSO areas 1, 2, 3, and 5 on Plate 4, located in the back of this DEIS. They are considered to be part of the "standard" requirements of this impact prediction for geese. Rationale for selection of only white-fronted geese and black brant for intensive impact prediction can be found in the various EIS Scoping Documents culminating in the "Record of Decision" (McVee, 1982).

Based on the present knowledge of goose and other waterbird ecology on NPR-A, there are only a few known locations where oil and gas development fields and/or transportation corridors would risk significant impacts at the NPR-A waterbird population level. There are even fewer locations where impacts could be of significance to continental and world populations. Most of these locales were identified by the panel (Chapter Two) with optimism that any previously unknown areas would be discovered and studied during the planning phase of the lease tract delineation and permitting processes so that appropriate protective measures could be applied. The panel's assessment of impacts assumed that any development on the Coastal Plain of NPR-A would receive sufficient mitigative planning and field effort to insure that impacts are insignificant. In the large portions of NPR-A, waterbird values are so widespread that a development field encompassing 60 to 80 square miles but actually occupying much less than ten percent of the area's surface with production facilities would not measurably affect total population levels. This same unmeasurable effect on waterbird population levels is also applicable to well planned transportation corridors and sufficiently restricted land, sea, and air transportation, if they generally avoid the NPR-A coastline and the area to the north and east of Teshekpuk Lake.

The Waterbird Discussion Panel (WDP) concluded that any fields, roads or pipelines in or through the Teshekpuk Lake Goose Molting Area (TLGMA) would result in the displacement and death of geese. The analysis which follows quantifies these predicted impacts.

Summary Hypothetical Impacts For Geese

A long-term loss of at least 20 percent of the NPR-A black brant population and three percent of NPR-A white-fronted goose population are predicted.

Discussion of Comprehensive Analysis

This analysis is based on the development of a field in the TLGMA (Figure 12) and on the following information about use of TLGMA habitat by geese. Each summer, the TLGMA is occupied by:

- ° Black brant-(about 30,000 of the estimated Pacific Flyway population of 140,000).
- ° White-fronted geese-(about 5,000 non-breeding birds molt in the TGLMA). The Central Flyway population of white-fronts is estimated at 75,000 birds.
- ° Other waterfowl-(about 15,000 non-breeding birds of the Taverners race (Branta Canadensis taverneri) of Canada Geese molt annually in the TLGMA). The Taverners race is estimated at 100,000 individuals.

It is assumed that total displacement of molting use would occur within the 60 square mile Smith River field. Using Derksen, Eldridge and Rothe (1979) distribution patterns, there would be about 2,500 black brant, about 1,000 white-fronted geese and about 1,700 Canada geese displaced.

For analytical purposes, molting habitat for geese was assumed to be at carrying capacity. Displacement of molting from Smith River field would result in short-term intra- and interspecific competition for habitat. All geese displaced would be lost to the population. In addition, losses due to habitat competition would occur as shown in Table IV-2.

Table IV-2 Loss of Geese Through Habitat Competition and Displacement

Short-term=	:	Long-term loss=
(Displacement & Competition)	:	(Displacement)
Black Brant = 3,750	:	Black Brant = 2,500
White-fronted = 1,500	:	White-fronted = 1,000
Canada = 2,550	:	Canada = 1,700

With the exception of the Island Lake black brant nesting colony encompassed by Smith River field, all other goose nesting is by white-fronted geese at a seven per square mile density. Black brant nesting colonies are very sensitive to disturbance and the entire colony would likely be displaced by development and lost. White-fronted geese nesting is assumed to arbitrarily decrease by 25 percent within the field due to disturbance. Canada geese do not nest in the area. These losses would be 200 adult brant which formerly nested in the area; and approximately 105 adult white-fronts (60 square miles times 7/4 white-fronts per square mile).

Habitat alteration and disturbances would result from roads from the Smith River field to Lonely or to the Kogru River Field. One square mile of white-fronted goose nesting and molting habitat would be lost for every linear mile of road. About 140 white-front adults that formerly nested in the vicinity of the road would be lost. The road would also displace 500 molting brant, 1,000 molting Canada, and 300 molting white-fronts.

For analytical purposes it was assumed that overflights would occur above the total nesting and goose molting habitat within the TLGMA.

The losses resulting from overflights were arbitrarily set at about 350 nesting white-fronts and 300 molting brant, 1,500 molting Canada geese; and 500 molting white-fronted geese.

Total displacement and loss from all assumptions after a new system equilibrium is reached, would be at least 6,200 brant, 1,600 white-fronts, and 4,200 Canada geese.

The preceding analysis is not the worst case for geese. If a 60 square mile field were located farther to the east of the Smith River location shown on Figure 12, impacts would be magnified at least by two times since black brant molting use becomes heavier as one moves from west to east in the TLGMA. Shifting a hypothetical field to other TLGMA locations would probably yield similar results, although total numbers of geese lost and the ratios among species would change.

A major problem in predicting impacts from TLGMA development stressed by the WDP was lack of information on changes in goose molting patterns. It is not known if the TLGMA is already at carrying capacity for molting geese or if the population's limiting factor is to be found outside the TLGMA. It is known that molting geese are very sensitive to any type of disturbance and are not likely to habituate to human activities. Molting birds are in poor physical condition. Fat reserves are so low that there is a high probability that displacement from preferred habitat by disturbance, once the molt is underway, would be lethal.

The above analysis of the effects on geese from oil development in molting and nesting habitat is illustrative and is not intended to be used as a precise forecast. Loons, swans, ducks and shorebirds also use the TLGMA during various parts of the snowfree season, and it is also the range of the resident Teshekpuk Lake Herd of caribou. The TLGMA represents an area of great wildlife diversity.

5. Comprehensive Analysis of Peregrine Falcon

Direct Impacts

Existing NPR-A standard stipulations (see Plate Nine, end of document), applied to both active and historical nest sites and enforced, would reduce any direct impacts of petroleum exploration, development and production to levels of unmeasurable significance. That is, to comply with the Endangered Species Act, no permitted facility, activity or operation would be allowed to disturb peregrine falcons or disrupt their nesting success or significantly alter their hunting habitat. At present, the Wild and Scenic Rivers study withdrawal from leasing provides additional protection to almost all active peregrine falcon nest sites on the Reserve. However, if no wild and scenic rivers designations are made on the Reserve, there would be no withdrawals from leasing except those recommended by this EIS.

Indirect Impacts

Any development within NPR-A could increase human access to peregrine falcon nest sites. These nests, easy to locate without maps due to the intensive

nest defense behavior exhibited by the pair, often can be entered easily from the top of a bluff. Peregrine falcons also may be disturbed by activities below the nest site. If the disturbance is great enough, nest failure is probable.

Although permitted petroleum activities would not cause impacts on peregrine falcons, activities indirectly associated with increased human access to remote areas resulting from petroleum development may affect them. These include: increased recreational boating, hunting and fishing on NPR-A, especially within the Colville River drainage due to expanded facilities and work forces at established NPR-A support bases such as Umiat or at new support bases such as Nuiqsut; or increased access to NPR-A by the general public if scheduled commercial airline service began supporting bases such as Umiat or if industrial haulroads were opened to public use. Any increase in recreational use of the Colville River drainage would increase the amount of nest defense behavior by the peregrines and decrease the time available for incubating or hunting. It is also probable that some recreationists would be either uninformed or uncaring enough about the need to protect endangered species to cause some loss of nesting success through intentional or unintentional disturbance at the nest site.

Increased summer subsistence use of the Colville River drainage by subsistence harvesters employed in NPR-A developments could also inadvertently disturb peregrine falcons.

Use of the Colville River drainage as a flight corridor in violation of the 1500 foot (457 meters) altitude and one mile (1.6 km) horizontal distance from any peregrine falcon nest site stipulation established in 1977 for the period April 15 through August 31 each year would add further stress. Violations would be most likely to occur during inclement weather when flights in support of petroleum activities would be forced to lower altitudes for air safety concerns. Private or air charter aircraft pilots could violate the regulations at any time due to ignorance of the poorly publicized regulations.

TABLE IV-3

PRESENT PRODUCTIVITY OF NPR-A PEREGRINE FALCONS
(ADAPTED FROM DITTRICK AND SWEM, 1981)

	1967	1968	1969	1971	1973	1978	1979	1980	1981
Total # of Pairs	27	31	33	25	14	15	16	21	24
# of Pairs With Young	18	16	13	9	4	8	6	12	12
# of Young Observed	34	34	26	14	9	14	15	29	31
Young Per Total Pair	1.26	1.10	0.79	0.56	0.64	0.93	0.94	1.38	1.29

Discussion of Comprehensive Analysis

In order to illustrate the types of indirect impacts on peregrine falcons that may be associated with development activities, analytical Case #1 (Figure 11)

which lies in the Colville River drainage will be utilized. The EIS wildlife biologist developed this peregrine impact analysis for illustrative purposes. It is only one of many possible combinations of events. However, it does point out that all sources of indirect impacts stemming from petroleum development must be considered and mitigated, as increasing human use of NPR-A can lead to loss of peregrine falcon reproductive success.

For analytical purposes it was assumed that all petroleum exploration, drilling and other permitted development activities would be responsibly executed by the Lessee or his agent with no measurable impact on peregrine falcons or their habitat.

The present productivity of peregrine falcons within the Colville River drainage was set, by assumption, as that shown in Table IV-3.

Assumption: Hypothetically, there are 25 pairs of peregrine falcons on the mainstream of the Colville River in Year Zero. Year Zero is assumed to be the year before the industrial haulroad from the Dalton Highway into NPR-A is opened and before commercial air service available to the public begins scheduled service. A hypothetical survey in late July of Year Zero on the Colville River found a total of 25 nesting pairs, 14 pairs with young producing 35 young. The ratio of young to total pairs is, therefore, 1.4 young per nesting pair ($35 \div 25$).

These hypothetical Year Zero results would be encouraging to the biological community as the ratio of 1.4 (young/total pairs) for the purposes of this analysis is assumed to be the minimum or threshold ratio that if obtained by a total breeding population of 25 pairs would indicate a recovering population.

The EIS wildlife biologist assumed that in Year One both the haulroad connecting NPR-A to the Dalton Highway opens to industrial traffic and commercial airline passenger and freight service begin to the State owned airport at Umiat. Relative cost of access to NPR-A is reduced to the general public and is already provided by the Lessee or his agents for all industrial workers.

Based on these assumptions, the boaters, hunters and fishermen made up of both off-duty industrial workers and the general public, begin to use the roads and short air charters to access the Colville River both up and downstream from Umiat. Heaviest use occurs between June 15 and August 15 when the weather and river conditions are most suitable.

In the opinion of two raptor biologists, increased recreational use of the Colville River drainage would lead to activities that would threaten the nesting success of peregrine falcons and other raptors (Dittrick and Swem, Personal Communication, 1982).

- ° The nests of cliff nesting raptors are highly visible along rivers in NPR-A. In addition, the birds' nest defense behavior attracts attention to the nest location. Curious recreationists especially would want closer looks despite disturbance to the raptors. Many of the best spots for fishing on the rivers are at the base of bluffs where the water is deepest. These bluffs are often preferred raptor nest sites. Extended periods of time fishing in front of a raptor nest may cause prolonged nest defense.

- ° Camping directly across from active nests may distract birds from their daily routine and endanger nesting success. Climbing bluffs for better views would disturb the birds.

Should parents leave the nest and exhibit nest defense, these behavior for prolonged periods until people leave the immediate vicinity, human/peregrine falcon confrontations could be fatal to the eggs or chicks, especially during freezing rain conditions common to the Colville River. A hypothetical survey of nesting success in late July of Year One would illustrate the effects on chick survival should such extended confrontations occur.

Total number of pairs	=25
Number of pairs with young	=12
Number of young observed	=30
<u>Young</u>	
Total Pairs	= 1.2

This hypothetical Year One population is below the assumed peregrine falcon recovery threshold of 1.4 young/total pair.

The DEIS wildlife biologist assumed that in Year Two of this hypothetical scenario, regulatory agencies recognizing a need for better control of peregrine falcon/human confrontations institute an intensive public awareness program. Every river user would be informed of new camping, fishing and hunting regulations governing permissible areas along the Colville River. A map is provided clearly identifying all known peregrine falcon nest sites surveyed in Year One. These restrictions would be self-imposed.

In the hypothetical Year Two, no camping in restricted areas was observable by professional guides or by passing pilots cooperating with the regulatory agencies. But in this scenario pilots observe occasional instances of recreationists stopping for prolonged periods in restricted areas apparently to observe a peregrine falcon nest during the critical period for the survival of the young. There are rumors of a party's deliberate use of the furnished maps to enter a nest during inclement weather to photograph the young.

The hypothetical survey of nesting success in late July of Year Two based on the above scenario illustrates the possibility of continuing reduction in peregrine falcon recovery:

Total number of pairs	=25
Number of pairs with young	=12
Number of young observed	=30
<u>Young</u>	
Total Pairs	= 1.2

This hypothetical survey indicates the population would still be below the minimum recovery threshold of 1.4 young/total pair assumed earlier to indicate recovery.

Raptor biologists Dittrick and Swem (pers. comm., 1982) feel that until some type of enforcement presence is established on the Colville River, loss of sub-adult peregrine falcons to the black market for falconry is also possible, especially if specific maps of the active nests are furnished to the general public.

It was assumed that in Year Three of this hypothetical model, regulatory agencies in cooperation with the Lessee establish an intensive monitoring program of Colville River use. Rangers patrol the river in boats or aircraft regulating river use. Stopping or camping adjacent to occupied bluffs is prohibited and restricted areas are shown on maps without revealing nest sites. All restricted areas are marked with signs on gravel bars across from occupied bluffs. Potential river users would be informed of restrictions through a mail campaign and the media. All users are contacted through air charter services, at access points, or on the river by patrols.

In late June of hypothetical Year Three, rangers make a helicopter rescue of a photographer injured in a fall from a bluff while attempting to enter a nest. Despite a constant freezing rain, both parents exhibited nest defense behavior until the area was finally cleared. All four chicks in the nest died. Another loss of one chick occurred when it was dislodged from a nest during a banding attempt on the Year Three survey.

The annual hypothetical survey in late July of Year Three found the population was still below the 1.4 young/total pair assumed recovery threshold. The 25 nesting pairs still had a young to pair ratio of 1.2 (14 pairs with young, 30 young observed).

In summary, this hypothetical analysis is neither intended as an attack on any responsible recreational or industrial use of NPR-A's rivers which should be compatible with continued protection of the peregrine falcon nor on the hypothetical ineffectiveness of BLM to protect endangered species. It does, however, indicate that the major cause of impacts on peregrine, increased recreation use of the Colville, is largely outside the control of the Lessee. Impacts to peregrines thus are not resolveable through stipulations aimed at the Lessee's activities. The BLM response to recreation impacts is discussed under the preferred alternative (Chapter Five).

6. Comprehensive Analysis of Other Raptors

The other raptors of NPR-A are divided into two groups: tundra nesters and cliff nesters. The distribution and annual population levels of these birds on NPR-A are highly variable and much more prey dependent than that of the peregrine falcon.

It does not appear that there will be any measurable impacts on the tundra nesting snowy owl or short-eared owl. Relatively few individuals of these broadly distributed species would ever be exposed to the projected type and level of NPR-A oil development given in Shepard et., al. (1982). Their rodent prey, because of its broad population base, would never suffer significant loss of carrying capacity except in a few localized areas near actual facilities.

The other cliff nesting raptors of NPR-A have many similarities to peregrine falcon with respect to choice of nest site and nest defense behavior. Potential loss of reproductive success as a result of increased human disturbance is likely. Oil and gas development may result in direct impacts at the nest site with loss of eggs or chicks possible. While it may be valid to assume that peregrine falcon stipulations would secondarily also protect the majority of other raptor nest sites, not all of these raptors nest sites would be protected.

Summary of Comprehensive Analysis

- ° Displacement and/or loss of reproductive success of some non-endangered cliff-nesting raptors as a direct and indirect result of development.
- ° Possible interspecies competition for nest sites among displaced raptors and the peregrine falcon leading to possible declines in overall peregrine falcon nesting success.

Discussion of the Comprehensive Analysis

It is not known how many other cliff nesting raptors would receive secondary protection under the peregrine falcon protective stipulations presently in force. However, the following narrative case analysis applicable to any development in cliff nesting raptor habitat will illustrate possible impacts.

- ° Assumption: Due to the protective stipulations for the peregrine falcon, any permitted activity in cliff-nesting raptor habitat is prejudiced in its choice of options. When an impact is certain, such as from designation of gravel mining areas, rights-of-way, or recreational campsites, the permitted activity must avoid any peregrine falcon impacts regardless of impacts to other raptor species.

On a hypothetical reach of the Coville River drainage, there are only two permitting options available for a proposed oil activity. Option A would impact one active and one historic peregrine falcon nest site on cliff A. Option B would totally eliminate the use of adjacent cliff B to three gyrfalcon pairs but no peregrine falcons. With a strict interpretation of the peregrine falcon stipulation, Option B is selected.

In a hypothetical raptor survey in years following the permitting decision and subsequent impacts on cliff B, cliff A is found to be occupied by two gyrfalcon pairs which have displaced peregrine falcons from both the active and historical nest sites. While it is probable that the peregrine falcon pair has found a suitable nest site elsewhere, their reproductive success may have suffered both short and long term impacts if replacement habitat is less than optimal.

B. Impacts to Key Species Under Deletion Leasing

Of the key species discussed above, caribou, grizzly bear and geese would meaningfully benefit from the deletion alternative. The areas being considered for deletion are shown on Plate Four, found in the back of this DEIS.

Deletion of area one on Plate Four would largely eliminate the predicted impacts to geese occurring under Standard Requirements Leasing.

Deletion of the WAH's core calving area (area two on Plate Four) and deletion of the TLGMA, which is also the TLH calving area, would substantially reduce the impacts to caribou from NPR-A development.

Similarly, deletion of Southwestern NPR-A (area three on Plate Four) would benefit grizzly bear by creating the protective enclave sought by Reynolds (1979).

It is not felt that any form of deletions would substantially reduce predicted impacts for peregrine falcons and other cliff nesting raptors. These birds will be most impacted by indirect effects of development such as increased public access to their nesting sites along NPR-A's major rivers.

Little is known of polar bear use of the Reserve or of NPR-A's significance to regional polar bear demographics. It is not possible to meaningfully identify areas which could be deleted to protect polar bear.

C. Deferral Leasing

This alternative could reduce estimated impacts to key species in several ways. First, improvements in environmental protection practices developed on areas initially leased in NPR-A could be transferred to these sensitive environments. Second, habituation to activities outside sensitive environments may mean that when caribou or geese begin to encounter those same activities in critical habitat, they may be less threatened.

Caribou: The Caribou Discussion Panel recommended deferral of leasing in the range of the Teshekpuk Lake Herd (TLH) until at least 1988 if the area could not be permanently withdrawn from the leasing program. The TLH deferral zone is shown as Area 6 on Plate 5 in the back of this DEIS. This delay would allow current studies on the TLH to be completed and analyzed with respect to the knowledge gained from studies on long-term effects on the CAH. Deferring leasing in the range of the TLH would also insure that any discovery would not come "on-line" until after the decline of Kuparuk and Prudhoe to the east, thereby limiting the number of calving grounds receiving simultaneous impacts.

The panel also recommended that an area adjacent to the present WAH central calving area be deferred from leasing (Area 5 on Plate 5). It is thought that as the WAH population grows these areas will become heavily used for calving. Therefore, these tracts are recommended for deferral until long term trends become more obvious.

An area generally west and north of the core Utukok WAH calving area (Area 4 on Plate 5) is also being considered for deferral at the request of the North Slope Borough. The village of Point Lay has requested deferral here to mitigate possible loss of subsistence caribou hunting.

Grizzly Bear: Deferral of leasing as a mitigation of expected grizzly bear impacts does not appear to offer any clear advantage outside of the recommended deferral in southwestern NPR-A for caribou (Area 4 on Plate 5 located at the back of DEIS). Although it is possible that future changes in oil field technology may eliminate many habitat impacts, those created by human/bear encounters possibly lethal to the bear will still occur.

Polar Bear: It is not believed that deferral of leasing in onshore polar bear habitats would be of any long term advantage. To date, there is no evidence to confirm that properly controlled developments in nearshore habitats would have any significant effect on polar bear demographics.

Geese: The Waterbird Discussion Panel (WDP) recommended deferment of leasing in the Fish Creek Delta near Nuiqsut (Area 8 on Plate Five). This recommendation was made to allow an opportunity for ecological studies on the Fish

Creek-Colville River Deltas to be completed by 1987. DEIS discussion tracts numbers 162 and 163 fall within the recommended deferral area as well as some village lands to the north of tracts 162 and 163. Completion of ecological studies on the Fish Creek salt marshes which receive seasonal use by geese will increase the ability of land managers to predict impacts and design effective mitigation during the lease tract selection and permitting processes.

Finally, the deferral alternative would cover some lands also identified for consideration under the deletion alternative and the amount of deleted habitat would be reduced. Area 9 and 10, on Plate Five, in the back of this DEIS, shows lands being considered for deletion under the deferral alternative.

Peregrine Falcon: Under the provisions of the Endangered Species Act, BLM cannot authorize any activity that would impact upon an endangered species. Whether a nest site is on or off a lease is immaterial to this law. Even if all peregrine falcon habitats were deferred from leasing, indirect impacts from increased recreational use of NPR-A rivers may still threaten peregrine falcons. Therefore, deferred leasing would not significantly benefit the peregrine falcon.

Other Raptors: There are no clear advantages to deferred leasing in preferred cliff-nesting raptor habitat. As with the peregrine falcon, deferment of leasing would not necessarily result in reduction of indirect impacts from increased recreational use of the NPR-A river systems.

D. Design Solution Alternative

The presently required and proposed "standard" leasing and permitting stipulations presented in Plate Nine, in the back of this DEIS, are mainly directed towards controlling the impacts of further exploration activities on NPR-A. They are based on previous experience with the Federal government's NPR-A exploration program. Previous oil activities governed by these stipulations have resulted in few, if any, significant impacts on NPR-A's resources. Should these types of stipulations continue to govern all future exploration and winter exploratory operations are used in NPR-A's most sensitive environments (that is, the Utukok Uplands, the area around Teshekpuk Lake, and certain coastal areas), then impacts from further exploration within NPR-A would be insignificant. These are the conclusions of the participants in the "NPR-A Caribou/Waterbird Impact Analysis Workshop" (Gilliam and Lent, 1982).

However, the granting of a lease also grants the lessee the implied right to develop any discovery. While the Federal government may specify the methods of development to be used so that impacts are minimized, the Lessee has a "right" to develop and produce the discovery.

Implementing the Federal government's responsibility to protect NPR-A resources before the location and type of petroleum development activity requires a framework for design solutions flexible enough to cover greatly differing levels, types and locations of activities. Design solutions to minimize environmental impacts would be implemented as proposed leasing/permitting stipulations for future leases or activity specific permits. The proposed lease stipulation is presented below. Plate 6 indicates where these design solutions would be specifically applied.

1. Proposed Wildlife Protection Stipulation-Minimum Requirements

The applicant for any APD from MMS or other permit from BLM will, at a minimum, specifically identify and map all caribou, and/or grizzly bear use patterns within six miles of any proposed activity site in the foothills or Brooks Range, all caribou, polar bear and/or geese use patterns within six miles of any proposed activity site on the Coastal Plain and all peregrine falcon or other cliff-nesting raptor use patterns within six miles of any proposed activity site on NPR-A. The applicant will submit these maps as well as activity and site specific plans showing how facilities and/or operations will be designed to minimize disturbance to caribou, polar bear, grizzly bear, geese, peregrine falcon or other raptors.

a. Applicant's Residual Impact Analyses

The applicant will accompany all submitted plans with an analysis(es) of the level of impacts remaining after all applicant designed mitigations are applied. This analysis(es) will be accompanied by an outline of the applicant's quality assurance program to insure compliance with all mitigative measures.

b. Optional Requirements

The Fairbanks DM, BLM, after consultation with BLM resource specialists, other regulatory agencies and/or regional wildlife ecology and sensitivities before being required to make a BLM permitting decision or a response to MMS.

2. Processing Procedures

These submitted maps, plans and studies will serve as the basis for restricting facility siting and activities in or near preferred caribou, grizzly bear, polar bear, goose, peregrine falcon and/or other cliff-nesting raptor habitats. Determination of the accuracy and adequacy of submitted materials will be the responsibility of the DMM with the required concurrence of the Fairbanks, DM, BLM or in the case of BLM permits, solely by the DM, BLM.

Exceptions for specific activities or facility siting may be granted when it can be shown by the Lessee or applicant that such activities or facilities will not likely have an adverse effect on these key species.

Exceptions for any permit must be specifically authorized in writing by the DMM, Onshore Field Operations, Alaska Region, MMS, with the written concurrence of the Fairbanks DM, BLM or in the case of BLM permits, solely by the DM, BLM and must be separately reviewed during any permit renewal or amendment process. Exceptions will be granted only after an adequate written evaluation of the location, timing, intensity and density of the proposed operations as well as the anticipated cumulative effects of multi-company activities.

Caribou: The NPR-A Caribou Discussion Panel (CDP) made several specific recommendations regarding "freedom of passage" design features and the level of activity allowable in a field or corridor during sensitive time periods for caribou (Gilliam and Lent, 1982). The CDP recognized that without a specific proposed project their recommendations were necessarily broad and qualitative. All roads, pipelines, maintenance procedures, activity schedules and permissible corridor activity levels must minimize caribou disturbance and avoidance and provide an opportunity, if behavioral changes are possible, for caribou to

gradually habituate to petroleum related operations on NPR-A. The design solution stipulation is a means of gathering adequate baseline information to identify effective "freedom of passage" design permitting solutions and generally reduce caribou disturbance to an acceptable level.

Grizzly Bear: Design solutions may reduce the number of worker/bear confrontations expected from developments in southern NPR-A and thereby reduce predicted population loss. Grizzly bear habituation to humans must be avoided. Grizzly bears that lose their fear of man and his environs are dangerous to public safety and must be removed or shot. Where design solutions for caribou encourage habituation, the design solutions for grizzly bear would discourage habituation.

The following guidelines must be incorporated into the activity and facility siting planning and permitting processes for all areas in southern NPR-A:

- ° Proliferation of satellite facilities away from the main field camp, except for drill pads necessary to drain a producing field, must be minimized.
- ° Consideration must be given to fencing all permanently inhabited facilities to restrict the workers and their waste to a manageable area; and to prevent unchallenged grizzly entry into a development.
- ° Public safety concerns must be modified to stress measures that maintain a safe distance between workers and bears rather than those that stress destroying troublesome bears. Bears must be tolerated within non-threatening locations in the field and prevented by fencing or other measures from gaining access to portions of the field where they may damage equipment or facilities. Sport hunting within the field must be eliminated.
- ° Use of field roads or airstrips by travelers not a part of field staff or under staff supervision must be restricted to prevent interaction with bears using remote parts of the field. All land and air travel emanating from the field must avoid disturbing adjacent grizzly bear use wherever worker safety concerns are not compromised.
- ° All permanent facilities must be located so as to maintain the highest compatible traditional bear use. Siting a facility within a known preferred feeding area or travel route must be avoided during the planning process.

The preceding design solutions may prove useless unless adequate site-specific baseline information concerning bear use is obtained as a part of the planning process. The "design-solution" stipulation for grizzly bears stresses the gathering of adequate baseline information.

Polar Bear: Design solutions for polar bear are similar to those identified for grizzly bear. The prime requirements involve: minimizing alteration of maternity denning sites near fields; assuring polar bear access around the periphery of a field by consolidating support facilities; carefully scheduling any activity that may disturb polar bears; and instituting a public safety and environmental awareness program that stresses avoidance of polar bears so that the number of human/ bear encounters lethal to either the human or bear are minimized.

Geese: Continued use of existing BLM waterbird protection lease stipulations (see Plate Nine at end of DEIS) will give MMS and BLM managers sufficient authority to restrict most oil and gas activities where required to minimize impacts during the period of May 20 to August 25 each year. The Waterbird Discussed Panel (Gilliam and Lent, 1982) recommended that aircraft overflights, surface travel and geophysical surveys be prohibited during summer in areas carrying no surface occupancy waterbird protection lease clauses (NSO areas 1, 2, 3 and 5 on Plate 3) or in areas deleted from the leasing program. Permitting low altitude aircraft overflights, surface travel, and summer geophysical surveys on other areas of the Coastal Plain would be done on the basis of existing site-specific environmental factors.

However, without the gathering of a site specific data base prior to permit application to focus on areas or values which require particular types of protection, application of specific restrictions over broad areas of operation may be either too restrictive, if no resource is actually present, or not restrictive enough if the specific mitigative measures required are incorrect. Therefore, the type of design solution stipulation required is one which stresses application of effective mitigations to the actual, not hypothetical, resource involved.

Peregrine Falcon: Despite public or agency opinion to the contrary, regulatory agencies and the Lessee or permit applicant share the responsibility for protection of an endangered species from measureable impact during all phases of a proposed project, activity or operation adjacent to the species habitat. No permitted activity will be allowed to impact peregrine falcons. Lease stipulations have already been designed to prevent any measurable direct impacts. The petroleum industry has agreed, by acceptance of their lease, to abide by these stipulations or forfeit their lease.

Indirect impacts on peregrine falcons cannot be taken lightly. The Colville River drainage hosts a world class density of the remaining Arctic peregrine falcons. The petroleum industry must do all possible to control indirect impacts including controlling the off-duty recreational activities of all personnel within a development field. For the majority of industrial workers, the mandated environmental awareness training will be sufficient but all workers must be made aware of the possible environmental consequences of their on and off-duty activities. The Lessee will be held responsible for the conduct of their own employees as well as those of their agents, contractors and sub-contractors. The Lessee may be held responsible for the activities of any service company personnel that benefit the Lessee or to whom the Lessee provides facilities or access such as salesmen, technical representatives, geophysical companies and visitors. However, the Lessee cannot be held responsible for the conduct of recreationists gaining access to the Colville River drainage through public facilities.

Other Raptors: Use of the "Proposed Sensitive Wildlife Protection Stipulation" as specifically tailored to the protection of other raptors as well as the peregrine falcon is the best design solution. The establishment of effective lease or permitting stipulations appears to offer optimal protections regardless of the final outcome of current Wild and Scenic River studies or BLM policy options to close the Colville River drainage to recreational use in early summer.

E. Seasonal Restrictions

Species which could be benefited by application of seasonal restrictions are discussed below.

Caribou: The Caribou Discussion Panel generally agreed that the impacts of exploratory activities can be controlled and mitigated if stipulations appropriate to the season and location are applied. Winter only geophysical and test wells were recommended on any areas near the Utukok calving grounds or within the range of the Teshekpuk Lake Herd. However, the panel did not believe seasonal operating restrictions would alleviate the expected impacts from developments in the calving areas of the WAH or TLH. Hence the recommendation for deletion.

The panel recommended convoying or otherwise limiting traffic on any east-west haulroad to increase the chances of caribou crossing success from May 15th to July 15th. Such curtailment of activity in the corridor could reduce impacts envisioned in the standard requirements impact predictions.

Seasonal restrictions may also be required to control the disturbances of aircraft operation, road and pipeline maintenance or other activities associated with a development. Many of these restrictions will be evident only after the specific caribou use patterns for a particular development site are known.

Grizzly Bear: Site-specific seasonal restrictions may be very effective in controlling impacts of development on local grizzly bear populations especially if used in conjunction with limited no surface occupancy clauses to protect high density denning, feeding and travel areas. As with all other restrictions, however, application of seasonal restrictions must be based on adequate baseline data to be able to determine what areas and what periods would require seasonal restrictions.

Polar Bear: Any seasonal restrictions proposed for polar bear protection must be based on a better understanding of onshore polar bear use than is presently available. Placing a seasonal restriction on activities within 20 miles of the coastline for the period from October to April in conjunction with a similar summer restriction to protect waterbirds could eliminate any possible development by a potential lessee. If any seasonal restrictions are to be made, they should be at the permitting level where site specific conditions have been assessed and the relative risk of polar bear disturbance is better understood.

Geese: Current NPR-A Lease Stipulation (See Plate Nine in back of DEIS) provide adequate authority to protect seasonally sensitive use of the Coastal Plain by geese. The Waterbird Discussion Panel (Gilliam and Lent, 1982) specifically recommended that geophysical, test well drilling and aircraft overflights below 1,000 feet be suspended for the period of May 20 through August 25 each year in all areas recommended for no surface occupancy or deletion from the leasing program.

Peregrine Falcon: Seasonal restrictions on the Lessee have already been adequately provided for in Lease Sale 822, Stipulation No. 4 and other recommended stipulations.

Other Raptors: Seasonal restrictions for peregrine falcon protection are generally applicable at the permitting level to other cliff-nesting raptors.

II. RECREATION IMPLICATIONS

The Alaska Outdoor Recreation Plan (State of Alaska, 1981) indicates that there is considerable demand for more recreation opportunities of the types the NPR-A would provide if roads were open to the Reserve. A survey conducted in support of the plan found that recreationists wanted more opportunity to pursue their desired outdoor experiences and that costly access and a lack of roads were the major constraints on a number of recreation experiences that the population could reasonably enjoy. The results of the survey most applicable to the NPR-A are:

- ° Eleven percent of the respondents in the Interior of Alaska would like to hunt more, ten percent would like to fish more and three percent would like more opportunity to kayak or canoe;
- ° Fifteen percent of the adult population and eleven percent of the children in Alaska either kayak or canoe;
- ° Twenty-three percent of Interior Alaskans claimed that high transportation costs were a barrier to increased pursuit of recreation, while sixteen percent stated that a lack of roads limited their choices.

Based upon these data and other information from the plan, the BLM has estimated what the effects of roads into the NPR-A for recreation would have on the Reserve. The purpose of developing this estimate was to place an upper limit on new recreation use. Thus it was conceived that all Interior Alaskan recreationists, within the categories of recreation activity (hunting, canoeing, fishing, etc.) who currently wish to recreate more would see the NPR-A development as an awaited opportunity to do so. Table IV-4 shows the effect of this assumption.

Using this assumption that the NPR-A roads represent the only meaningful new avenue of access for these 335 kayakers and canoeists and 410 hunters, the DEIS authors allocated the increased activities respectively to the Colville River and the Arctic Foothills within the NPR-A. Assuming a 75 day float season on the Colville River and assuming that float parties averaged two persons per party, the 335 kayakers/canoeists would represent an average of 2.23 parties per day on the river. This level of human use of the Colville River would very likely be enough to alter peregrine nesting success.

T A B L E I V - 4
Effect of NPR-A Roads on Recreation
(1990 chosen as analytical year)

	<u>Kayaking/Canoeing</u>	<u>Caribou Hunting</u>
Fairbanks Population*	74,500	74,500
Proportion of Population Engaging in activity more than one hour from residence	.15	.05
Number engaging in activity more than one hour from home	11,175	3,725
Proportion Desiring more time afield	.03	.11
Number who would spend more time in this activity	335	410

* Source: Beaufort Sea Petroleum Development Scenarios, Economic and Demographic Impacts (Department of Interior, 1979). Fairbanks was chosen as it is the only interior Alaskan urban area which would meaningfully benefit from new roads in the Arctic.

III. SOCIO-CULTURAL CHANGE

Recent literature on rapid growth in rural areas paints a picture of increasing crime, alienation, drug and alcohol abuse, bureaucratization of decision making and a general loss of well being wherever the slowpaced and predictable rural social environment undergoes rapid growth from energy development. One analysis of the problems and issues associated with energy "boom towns" states:

Unfortunately, our ability to extract and process mineral riches is not matched by our ability to deal with the social consequences and human costs of rapid growth and development. (Davenport and Davenport, 1980).

This DEIS discusses some changes in the social environment that may result from NPR-A oil development. However, the DEIS authors are aware that many social problems existed on the North Slope prior to energy development. A recent study (U.S. Department of Agriculture, 1979), rated 3,097 U.S. counties in terms of social well being. The North Slope Borough had the highest level of alienation of all U.S. counties according to that report. The alienation score used in this social well being study was based on two indicators: suicide rates and deaths from cirrhosis of the liver (Ross, Bluestone and Hines, 1979). This extremely high level of alienation predated oil and gas development on the North Slope. Thus current and future energy development may aggravate, rather than be the cause of, those social problems that residents of the North Slope will confront.

Recently, Inupiat communities have been stabilized by the income transfer and job creation programs of the North Slope Borough (University of Alaska, 1981). Borough spending is a major source of jobs and income for young Inupiat within the village setting (Alaska Consultants, 1981). They no longer have to leave the village to find jobs but can choose to remain in the village, supporting their households both with wages and through continuing a subsistence lifestyle.

These changes in Inupiat society will continue as the Borough pursues a "full employment for Inupiat" social policy, and they will continue without oil and gas development on the NPR-A. The rate and direction of these social changes cannot be predicted.

Oil development in the NPR-A would magnify the intensity of currently existing socio-cultural changes. Some of these changes will be viewed as beneficial; other changes will be defined as adverse. By a magnification in intensity BLM means that the frequency and breadth of socio-cultural changes would increase. Those Inupiat currently experiencing socio-cultural gains or losses would experience them more frequently if oil development comes to the NPR-A (frequency change). Inupiat not now experiencing those impacts would begin to experience impacts as NPR-A oil development proceeds (change in breadth of impacts). The general impacts are listed on Table IV-5.

Impacts to the rural subsistence lifestyle of North Slope peoples would vary from alternative to alternative. Under the standard requirements leasing alternative, the biologist writer of this EIS concluded that fields in the Teshekpuk Lake Area could lead to abandonment of that area by the Teshekpuk Lake Herd. Only a few wandering individual caribou would use the lands previously occupied year round by the 4,000 to 6,000 TLH caribou. In the view of the biologist, TLH caribou would merge with the Western Arctic Herd and at least seasonally would be outside the range of subsistence harvesters from Nuiqsut. Nuiqsut people likely would define the loss of access to these 4,000 to 6,000 caribou as a significant impact on their subsistence lifestyle. The biologist also concluded that fields developed in the Utukok core calving grounds of the Western Arctic Herd that under standard requirements leasing would likely split the WAH into two components with only a portion of the herd remaining migratory. Since much of the herd would no longer migrate south of the Brooks Range, the number of caribou available to hunters within the NANA region (Kotzebue, Kivaline and the villages of Noatak, Kobuk and Selawik River drainages) would be reduced.

In the view of the biologist, the deletion of the Utukok core calving area would, substantially reduce the risk of a split in the WAH. Thus the number of caribou migrating south of the Brooks Range would not be measureably changed by oil development under the deletion alternative. However, adoption of the deletion alternative alone would not resolve the issue of possible reduction in the number of caribou available to the people of Anaktuvuk Pass, Nuiqsut or the people of villages of the Upper Kobuk, Upper Noatak, Alatna and Koyukuk River drainages.

Pipelines originating outside the deleted lands in the Teshekpuk Lake Area could still act as a barrier to the traditional counterclockwise movement of the TLH, and the TLH may still abandon habitat near Nuiqsut. Pipelines arising in southern NPR-A outside the deleted WAH core calving area could still lead to a westward shift in the WAH fall migration and lead to the CAH abandoning

T A B L E I V - 5
POTENTIAL BENEFICIAL AND ADVERSE SOCIAL EFFECTS
(Adapted from 105(c) Studies)

Potential Events	Primary Impact	Secondary Impact
Increase in number of areas residents in response to NPR-A employment opportunities.	Shift cultural composition of region to non-Native.	Worsen race relations
	Shift sex ratio of population to predominately male.	Make maintenance of traditional culture difficult.
	Loss of regional isolation.	Stress social structure.
	Increase demands on transportation facilities and community services.	Intensify area crime problems.
	Increase demands for housing.	Increase alcohol/drug abuse and other health problems.
	Stimulate nontraditional use of wildlife.	Complete with subsistence use of wildlife and make subsistence hunting more difficult.
	Change traditional land use patterns.	
	Make new or increased demands on village and Borough government.	
	Increase cost of living.	
	Decrease numbers of subsistence animals.	Decrease opportunities to pursue traditional activities.
Habitat alteration (direct disturbance) or adverse influence on wildlife (noise from machinery or aircraft crates avoidance zones).	Increase access to traditional subsistence lands.	Stress traditional kinship patterns.
	Increase access to traditional subsistence lands.	
	Increase difficulty of locating subsistence animals.	
Associated Disturbance (from roads, pipelines flight corridors)	Harrass wildlife, especially subsistence species.	Degraded habitat for wildlife.
	Harass Native hunters.	Decrease subsistence resources.
Increase or maintain employment opportunities.	Decrease chronic problems of unemployment and under-employment.	Increase employment opportunities for women, young and old.
		Stimulate Native population stability.
		Stimulate competition between job time and subsistence time.
	Alter food habits.	Introduction of more non Inupiat food into diet leads to problems with teeth and gums, obesity and increased circulatory diseases.
	Increased household income.	Continuing gains in health care, especially reduced infant mortality, due to improved ability to finance medical services.
		Leads to more disposable income to use in pursuit of desired lifestyle.

habitat near Anaktuvuk Pass. Caribou would thus be outside the range of subsistence harvesters from Anaktuvuk Pass and out of reach of hunters from the Upper Kobuk/Noatak and Alatna to Koyukuk River villages.

The design solution alternative could further mitigate the barrier effect of roads and pipelines through selection of alternative designs or routes, convoying of trucks or using inventory control methods to reduce the number of trucks, and so on. The biologist concluded that these design solutions may reduce the barrier effect of NPR-A roads and pipelines. However, these design solutions have not been tested to determine their effectiveness in mitigating impacts to caribou.

Even if the design solution concept were implemented and the design solutions were found to be effective in reducing the barrier effect of roads and pipelines, caribou distribution could still be altered (see pages 67 and 92). It is not possible to predict whether this shift in caribou distribution would measurably reduce the number of caribou available to subsistence harvesters. Significant subsistence impacts to harvesters in the Upper Kobuk and Upper Noatak and Alatna and Koyukuk River villages could occur if a major shift in caribou distribution results from developments in southern NPR-A. Similarly significant subsistence impacts could be experienced by Anaktuvuk Pass hunters if there is a major shift in the distribution of either the CAH or WAH. However, the EIS preparers could not quantify the effect of the design solution alternative on caribou migration (how many caribou would migrate south through historic passes versus how many would shift fall migration westward). Consequently, as it is not possible to predict the degree to which WAH distribution would be altered, it is also not possible to forecast whether NPR-A leasing and development would lead to significant subsistence impacts to the hunters of the Upper Kobuk/Noatak to Alatna and Koyukuk area.

It is also not possible to predict how many CAH caribou would no longer go south beyond the road and pipeline under design solution leasing. Therefore, subsistence impacts from adoption of the design solution leasing alternative on the people of Anaktuvuk Pass cannot be predicted.

CHAPTER FIVE

COMPARISON OF ALTERNATIVES AND RESIDUAL IMPACTS

I. INTRODUCTION

This chapter is comprised of four sections: a comparison of the effects of the DEIS alternatives, a preliminary identification of a preferred alternative, residual impacts under the Preferred Alternative and irrevocable resource commitments.

II. COMPARISON OF DEIS ALTERNATIVES

In Public Law 96-514, the 1981 Department of Interior Appropriations Act, Congress instructed the Department of Interior to begin an expeditious program of oil and gas leasing while mitigating reasonably foreseeable and significantly adverse effects of oil development. BLM believes that the proper criterion for comparing alternatives is, therefore, the relative effectiveness of the various strategies in mitigating impacts. This impact comparison is contained on Plate Seven in the back of this DEIS.

The decision criterion guiding BLM management is to maximize the amount of land offered for lease while mitigating reasonably foreseeable and significantly adverse effects on the environment from possible oil and gas activities. The terms mitigate, mitigating and mitigation are not precisely defined. Random House (Stein, 1980) provides a definition for the term mitigate which is: "to make less severe, intense, painful, etc." Mitigating the adverse effects of NPR-A oil and gas development under this broad definition of lessening the severity or intensity of impacts, can include a number of choices. These choices are shown in Figure 17. All the alternative leasing strategies fall along the mitigation continuum. Every alternative, including standard requirements leasing, would lessen the impacts of oil and gas development on NPR-A surface resources and existing uses. Thus any DEIS alternative, including standard requirements leasing applied Reserve wide, would fulfill the decision criterion and meet the test of the law by simultaneously expediting leasing and mitigating the adverse effects of development.

This NPR-A DEIS provides an opportunity for the public to assist the BLM in more precisely determining what is acceptable mitigation. The BLM hopes that in the case of NPR-A leasing, the public will aid the agency in selecting the point on the mitigation continuum which best balances the objective of expeditious leasing against the need to maintain (and perhaps enhance) a clean, ecologically diverse and healthy environment.

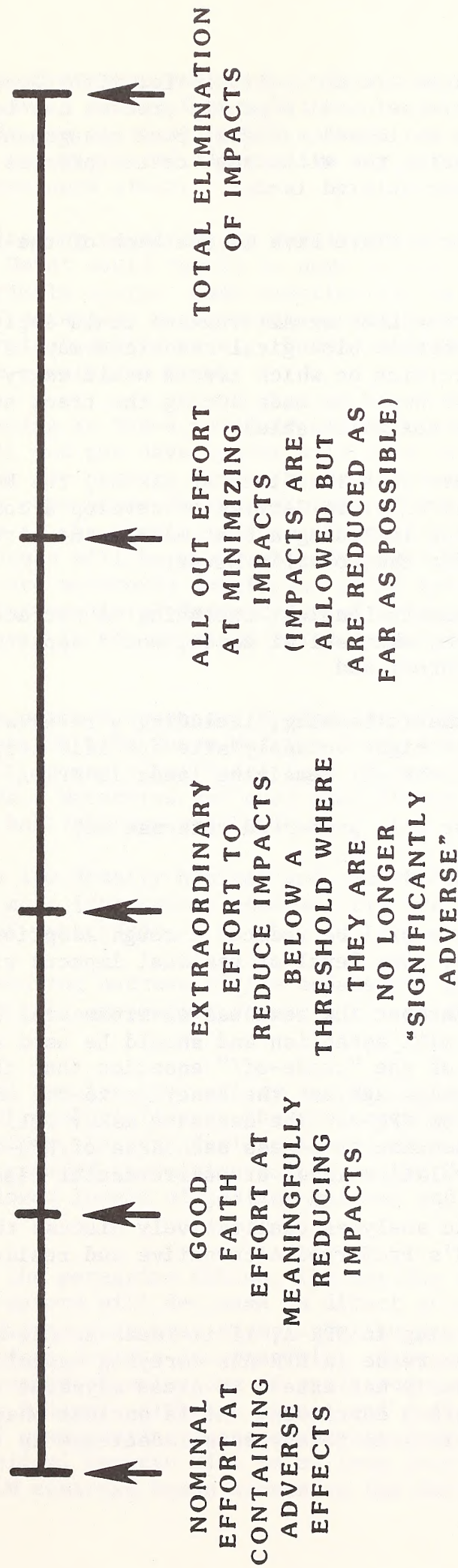
III. PRELIMINARY IDENTIFICATION OF A PREFERRED ALTERNATIVE

After careful consideration of the question of how to best balance the objective of maximizing the amount of lands available for lease against the mandate to minimize loss of surface values and interruption of existing surface uses, the NPR-A management team is prepared to recommend as the preliminary preferred alternative that:

- ° The Utukok Uplands core calving area and the area within the TLGMA containing the highest density of black brant molting habitat be deleted and not be scheduled for lease sale until such time as (a) an analysis of the need for withdrawal of these areas is completed, (b) if the above analysis

FIGURE 17

MITIGATION CONTINUUM



indicates that the lands are not suitable for withdrawal then the lands not be scheduled for lease until a public process has been used to determine when the lands should be leased and what best management practices should apply and (c) that during the withdrawal review process no rights of way would be granted across these deleted lands;

- ° Areas 4 and 8, from Plate Five in the back of the DEIS, be deferred until 1992;
- ° The Design Solution Leasing Alternative could apply anywhere in the Reserve where notable biological resources may be at risk of being impacted (the decision on which tracts would carry the design solution lease stipulation would be made during the tract selection process and published in the notice of sale);
- ° BLM will negotiate with the State of Alaska, the North Slope Borough and the U.S. Fish and Wildlife Service to develop a comprehensive raptor management program including a best management strategy for administering recreation use for the Colville River;
- ° Standard Requirements Leasing, including no surface occupancy restrictions for selected sites and habitat zones, would apply in NSO areas 1, 2, 3 and 5 on Plate Three; and
- ° Standard Requirements Leasing, including a reservation to the Federal government of the right to apply site specific stipulations at the permitting stage, cover all remaining lands in NPR-A.

Plate Eight summarizes this preferred alternative.

IV. RESIDUAL IMPACTS

The severity of impacts will be reduced through adoption of the Preferred Alternative. However, some level of residual impacts will remain.

This section will point out the residual environmental cost of NPR-A oil and gas development. It will establish and should be used as the likely environmental price portion of the "trade-off" equation that the Federal government and the public must weigh against the benefits to the nation of potential oil and gas production from NPR-A. The decision maker will use the criteria established in this section to assess each area of NPR-A proposed for leasing to determine if the relative level of environmental risk is acceptable.

The following synoptic analyses qualitatively discuss the predicted relationship between this EIS's Preferred Alternative and residual impacts to key wildlife species.

Caribou: Further leasing in NPR-A, if it leads to oil and gas development(s), will result in some decrease in NPR-A's carrying capacity for caribou. This loss of carrying capacity may extend to areas adjacent to NPR-A if they are crossed by transportation corridors. It is unclear whether this reduction in carrying capacity would lead to any actual decrease in the number of Arctic Caribou.

Data obtained from study of caribou reaction to development support a conclusion that most caribou would avoid rather than habituate to human disturbances. Thus developments outside the critical Utukok uplands central calving area which could occur under the preferred alternative may alter the distribution of caribou as they avoid developed areas.

Grizzly Bear: Further leasing resulting in developments(s) south of a line drawn from Point Lay to Umiat would result in some direct decrease in NPR-A's carrying capacity for grizzly bears. More importantly, developments in southern NPR-A would lead to confrontations between humans and bears in which the bear would be destroyed to protect public safety. These residual impacts are expected to be measureable at the population level.

Polar Bear: Further leasing in NPR-A north of a line drawn from Peard Bay to Nuiqsut that leads to oil and gas development will lead to some decrease in NPR-A's carrying capacity for onshore winter maternity denning by pregnant females. Destruction of some bears in the interest of public safety is also likely. It is not known if the predicted loss of denning habitat through alteration or loss of access will be measurable in polar bear populations as the significance of onshore maternity denning to polar bear populations has not been established. The predicted destruction of a few marauding bears within development enclaves is not expected to be measureable in the polar bear population.

Geese: With the limited surface occupancy protection of the coastal environment and deletion of the Teshekpuk Lake Goose Molting Area, development elsewhere in NPR-A would not result in any significant loss of carrying capacity for geese or other waterbirds. Waterbird use over most of the coastal plain is scattered and alternate habitats are available.

However, developments in low density habitat and the effect of panic response among birds when pilots must (for safety reasons) fly low over molting habitat will lead to some loss of waterbirds.

Peregrine Falcon: The nesting success of the endangered peregrine falcon on NPR-A will decrease in direct proportion to any increase in human disturbance near nest sites.

Because of the Endangered Species Act, oil or gas developments within NPR-A will not be allowed to directly influence the productivity of the endangered peregrine falcon. Therefore, leasing decisions will have no direct residual impact. However, any increased recreation access to the Colville River drainage may indirectly lead to lower levels of nesting success and correspondingly lower productivity.

Other Raptors: As with the peregrine falcon, the nesting success and productivity of other cliff-nesting raptors will decrease in direct proportion to any increase in human disturbance near nest sites. Unlike peregrine falcons, both direct and indirect residual impacts are possible. Most raptors will be secondarily protected because of selection of preferred nesting sites adjacent to that of the peregrine falcon. Although direct and indirect residual impacts are expected and loss of some nesting success appears inevitable, it is not predicted that these residual impacts will be of long term significance to raptor populations if BLM controls human access to the Colville River drainage.

V. OPPORTUNITY COSTS AND IRREVOCABLE RESOURCE COMMITMENTS

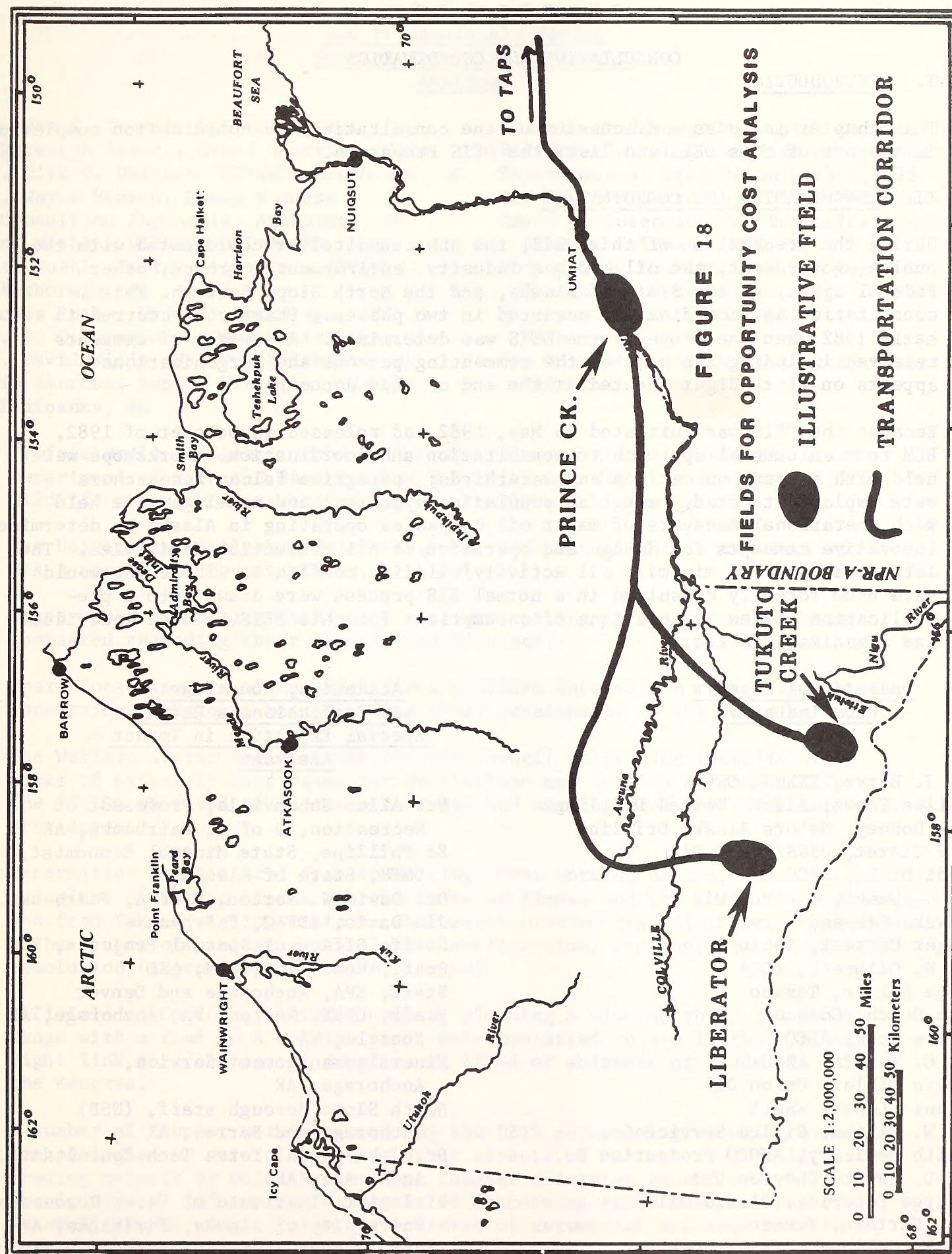
The human and financial resources committed to exploration and production would be lost in an opportunity cost sense. By opportunity cost, economists mean the value of goods and services which could have been produced if the human and financial resources dedicated to oil and gas development had gone instead to other productive sectors of the economy.

Similarly, the energy used in exploration, construction and field operation would also be lost in an opportunity lost sense (whatever else could have been produced with that energy will not be produced). The financial resources committed to NPR-A oil development if commercial production results would be considerable. For illustrative purposes, three fields were analyzed in terms of their capital requirements. These fields are shown below.

T A B L E V - 1
Fields For Opportunity Cost Analysis

<u>ILLUSTRATIVE FIELDS</u>	<u>NUMBER OF WELLS</u>	<u>ESTIMATED CAPITAL COSTS</u> (1982 dollars)
Tukuto Creek	92	\$ 1,685,100,000
Liberator	149	2,729,200,000
Prince Creek	149	1,225,900,000
TOTAL 3 FIELDS	340	\$ 5.640,000,000

About one-third of the gravel used in NPR-A development would not be reclaimable. Vegetation damaged or covered during facility construction will be replaced during the rehabilitation phase which preceeds site abandonment. The animals that would have been supported by the vegetation before it was destroyed should be viewed as irrevocably lost.



C H A P T E R S I X

CONSULTATION AND COORDINATION

I. INTRODUCTION

This chapter includes a discussion of the consultation and coordination completed in support of this DEIS and lists the DEIS Preparers.

II. CONSULTATION AND COORDINATION

During the preparation of this DEIS, the BLM consulted or coordinated with the public, government, the oil and gas industry, environmental groups, other Federal agencies, the State of Alaska, and the North Slope Borough. This consultation and coordination occurred in two phases. Phase one occurred in early 1982 when the scope of the DEIS was determined. A summary of comments received including the name of the commenting persons and organizations appears on Plate Ten located at the end of this document.

Because the DEIS was initiated in May, 1982 and released in October of 1982, BLM took an unusual approach to consultation and coordination. Workshops were held with experts on caribou and waterbirds; peregrine falcon researchers were employed to study peregrine population dynamics; and meetings were held with operational managers of major oil companies operating in Alaska to determine innovative concepts for design and operation of oil production facilities. The latter was done to minimize oil activity/wildlife conflicts. Those who would have been formally consulted in a normal EIS process were drawn into a pre-publication review and critique of assumptions for this DEIS. These individuals and organizations are:

Operational Experts
From Industry

S. J. Borys, EXXON, USA
Dallas Cross, Alaska United Drilling
Joe Downey, Nabors Alaska Drilling
Jim Storet, USGS/Husky Oil
Khoi Mi Le, ARCO
M. G. Waski, Chevron Oil
Alaska Gas and Service
Roger Herrera, Sohio
O. K. Gilbreth, AOGA
Pete Nelson, Texaco
Jim Dosch, Conoco
James Buck, ARCO
R. C. Heintz, ARCO
Kevin Tabler, Union Oil
Dennis Lohse, Shell
R. W. Elkins, Cities Service Co.
Keith McCleary, AMOCO Production Co.
W. D. Saver, Chevron USA
George Petering, Placid Oil
Don Hartman, Texaco
D. E. Galloway, EXXON, USA

Academics, Consultants
and Professionals Having
Special Expertise in Impact
Analyses

Dr. Allan Jubenville, Professor of
Recreation, U of A, Fairbanks, AK
Ed Phillips, State Mineral Economist,
DMEM, State of Alaska
Dr. David W. Norton, U of A, Fairbanks, AK
Jim Davis, ADF&G, Fairbanks
Staff, Office of Special Projects, BLM
Staff, Resources, BLM, ASO
Staff, EPA, Anchorage and Denver
Staff, USGS, Reston, VA, Anchorage, AK
Seattle, WA
Minerals Management Service,
Anchorage, AK
North Slope Borough staff, (NSB)
Anchorage and Barrow, AK
Dr. John Olson, Tetra Tech Consultants,
Anchorage, AK
Biologist, Institute of Water Resources,
University of Alaska, Fairbanks, AK
Staff, Alaska State Subsistence Division

Academics, Consultants
and Professionals Having
Special Expertise in Impact
Analyses

Dr. Joe C. Truett, LGL Ecological
Research Assoc., Grand Junction, Colo.
Dr. Dirk V. Derksen, USF&WS, Anchorage, AK
Dr. Wayne Hanson, Dames & Moore
Consulting Engineers, Anchorage, AK
Rosa Meehan, USF&WS, Fairbanks, AK
Phil Koehl, Raptor Biologist, ADF&G,
Anchorage, AK
Thomas Rothe, USF&WS, Anchorage, AK
Dr. R. D. Cameron, ADF&G, Fairbanks, AK
Dr. David Klein, USF&WS, Fairbanks, AK
Skip Ambrose, Raptor Biologist, USF&WS,
Fairbanks, AK

Members of Ukpeagvik Inupiat Corporation
History, Culture, Language Dept., NSB
Environmental Protection Office, NSB
Dr. David W. Norton, U of A, Fairbanks, AK
David G. Roseneau, LGL Ecological Research
Assoc., Fairbanks, AK
North Slope Borough Fish and Game
Management Committee
Dr. Peter Lent, USDI, BLM,
Washington, D.C.
Jim Curatolo, Alaska Biological Research,
Fairbanks, AK

Professionals assigned to the DEIS contacted specialists within the Alaska Department of Fish and Game and the U.S. Fish and Wildlife Service and other Wildlife researchers regarding impacts to biological resources.

The University of Alaska, Fairbanks, provided prepublication comments on NPR-A recreation opportunities.

Researchers conducting studies of nutrient cycling in Arctic waters were contacted regarding their unpublished findings.

Operations managers of Canadian firms provided information regarding gravel conserving techniques being used in field development in the Canadian Arctic.

The Western Arctic Regional Subsistence Council helped BLM identify NPR-A areas of extremely high value for subsistence and develop a framework for the ANILCA mandated subsistence hearings and meetings and impact minimization procedures.

Information was gathered from consulting firms working on comprehensive land use plans of Arctic Alaska for the State of Alaska and the North Slope Borough, and from Eskimo whaling captains who were contacted regarding their decisions on best uses of habitat zones (land classification) and insights into issue resolution (impact mitigation techniques).

Officials of Cominco, a mining company planning a mine south of the Brooks Range with a road to a coastal port, were contacted to see if their plans might link to transport of supplies to NPR-A or shipment of crude oil from the Reserve.

A number of Inupiat were contacted by the DEIS anthropologist using standard methodologies to determine, among other aspects of current Inupiat life, the trading network by which North Slope Inupiat maintains contacts with Inuit Arctic wide. Information was gathered concerning rules and patterns of intervillage marriage, rules and patterns of ceremonial exchange between

households and/or duties of active subsistence harvesters to share with dependent households. This information provided a basis for estimating how change among the Inupiat may be telegraphed to the Inuit culture throughout the Alaskan Arctic wide basis.

III. EIS PREPARERS

An interdisciplinary team of specialists prepared this DEIS. Their names, and specialties and the chapter to which they contributed are shown in Table IV-1.

T A B L E VI-1
E I S P R E P A R E R S

<u>PERSONNEL CONTRIBUTING</u>	<u>POSITION</u>	<u>PARTICIPATION BY CHAPTER</u>					
		I	II	III	IV	V	VI
Jerry C. Wickstrom	Program Manager, NPR-A	X			X	X	
Horace Sanders	Assistant Program Manager, NPR-A	X			X	X	
Keith Bennett	Regional Economist/EIS Team Leader	X	X	X	X	X	X
James K. Gilliam	Wildlife Biologist Research and Workshop Coordinator	X	X	X	X		X
Stan Shepard	Mining Engineer				X		
Lou Carufel	Aquatic Biologist			X	X		
Dr. Robert E. King	Anthropologist		X	X	X		
Robert Gal	Archaeologist		X	X	X		
Linda Thurston	Technical Editor	X	X	X	X	X	X
Donna Webb	Leasing Specialist	X					
Dorothy Preston	Land Law Examiner	X					

Illustrations

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James Mroczek

Word Processing Technicians

Support Services

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Joyce Godin
Debra Johnson

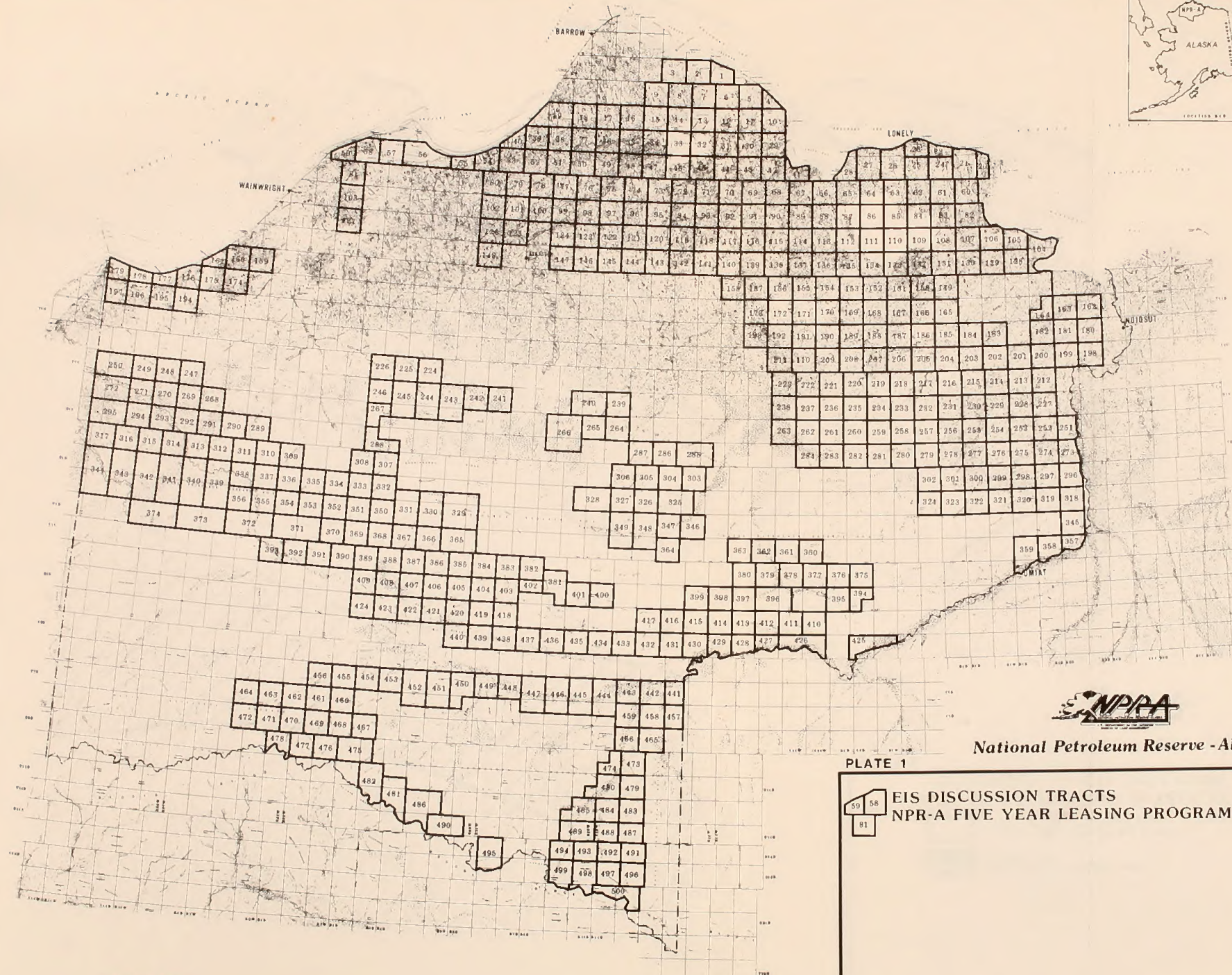
Joyce Jones

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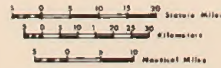


National Petroleum Reserve - Alaska

PLATE 1

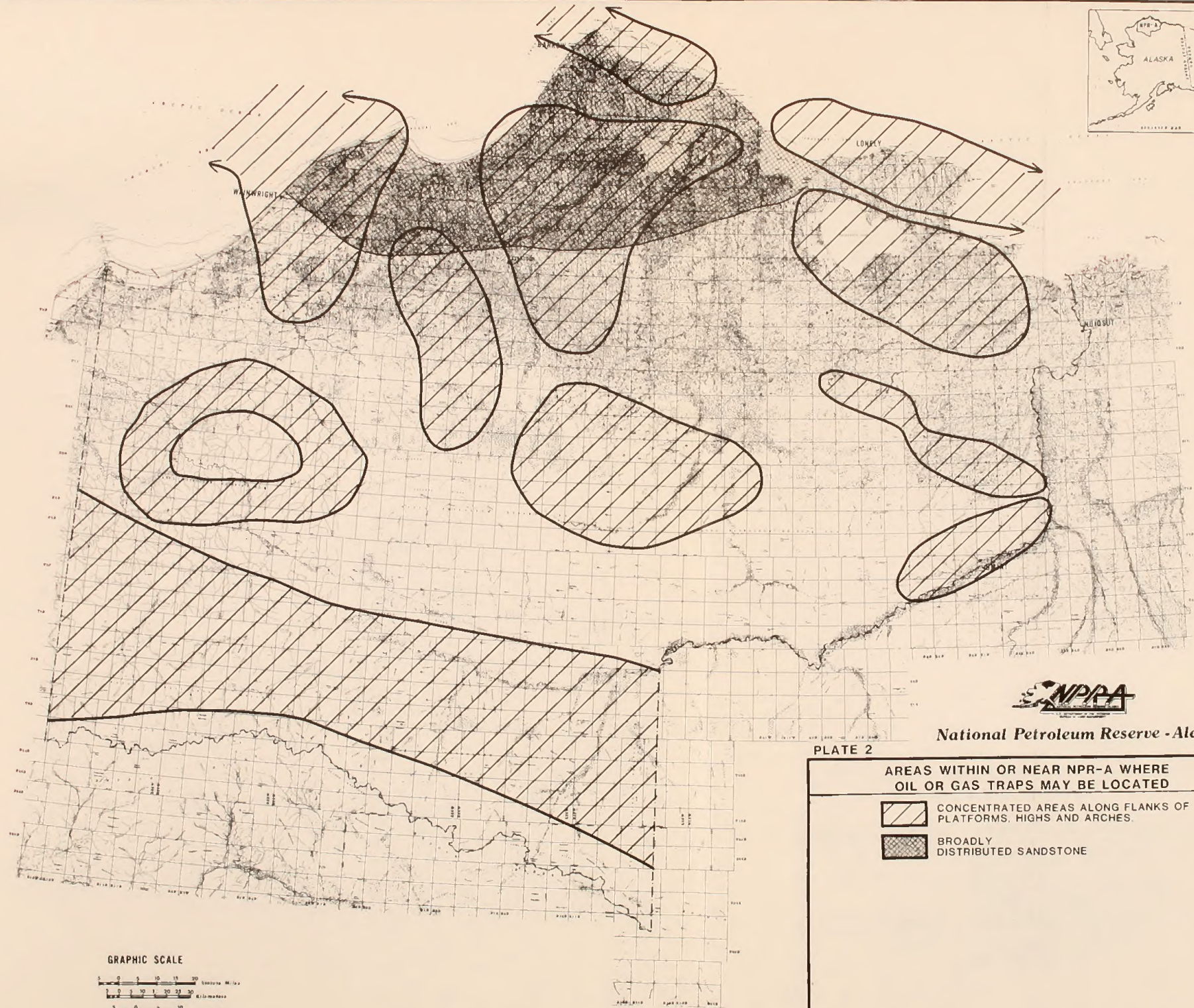
EIS DISCUSSION TRACTS
NPR-A FIVE YEAR LEASING PROGRAM

GRAPHIC SCALE



Universal Transverse Mercator Projection



JUNE 10, 1982

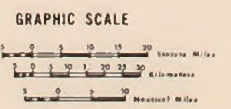


National Petroleum Reserve - Alaska

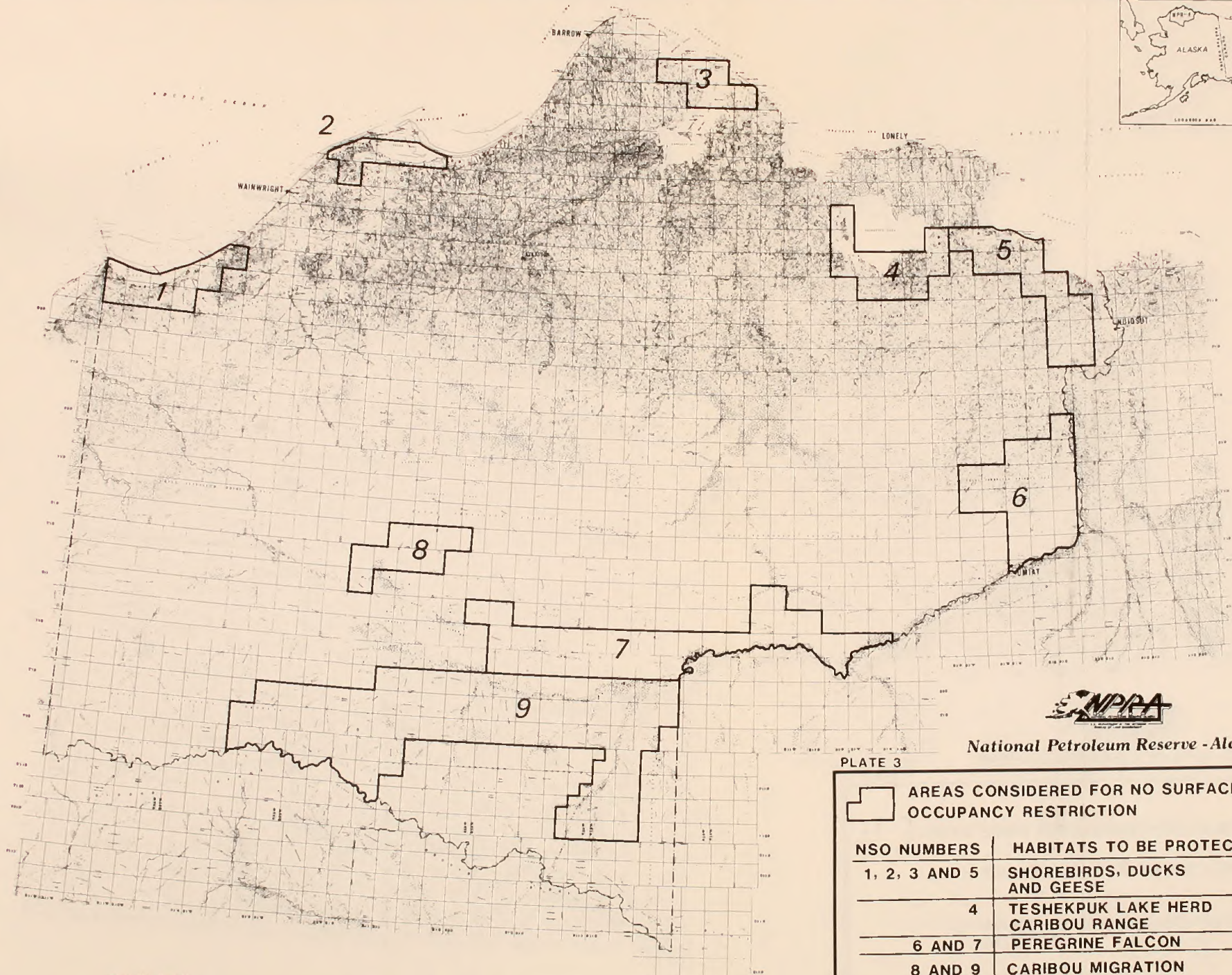
PLATE 2

AREAS WITHIN OR NEAR NPR-A WHERE
OIL OR GAS TRAPS MAY BE LOCATED

-  CONCENTRATED AREAS ALONG FLANKS OF
PLATFORMS, HIGHS AND ARCHES.
-  BROADLY
DISTRIBUTED SANDSTONE



Universal Transverse Mercator Projection



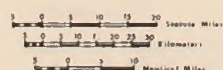
National Petroleum Reserve - Alaska

PLATE 3

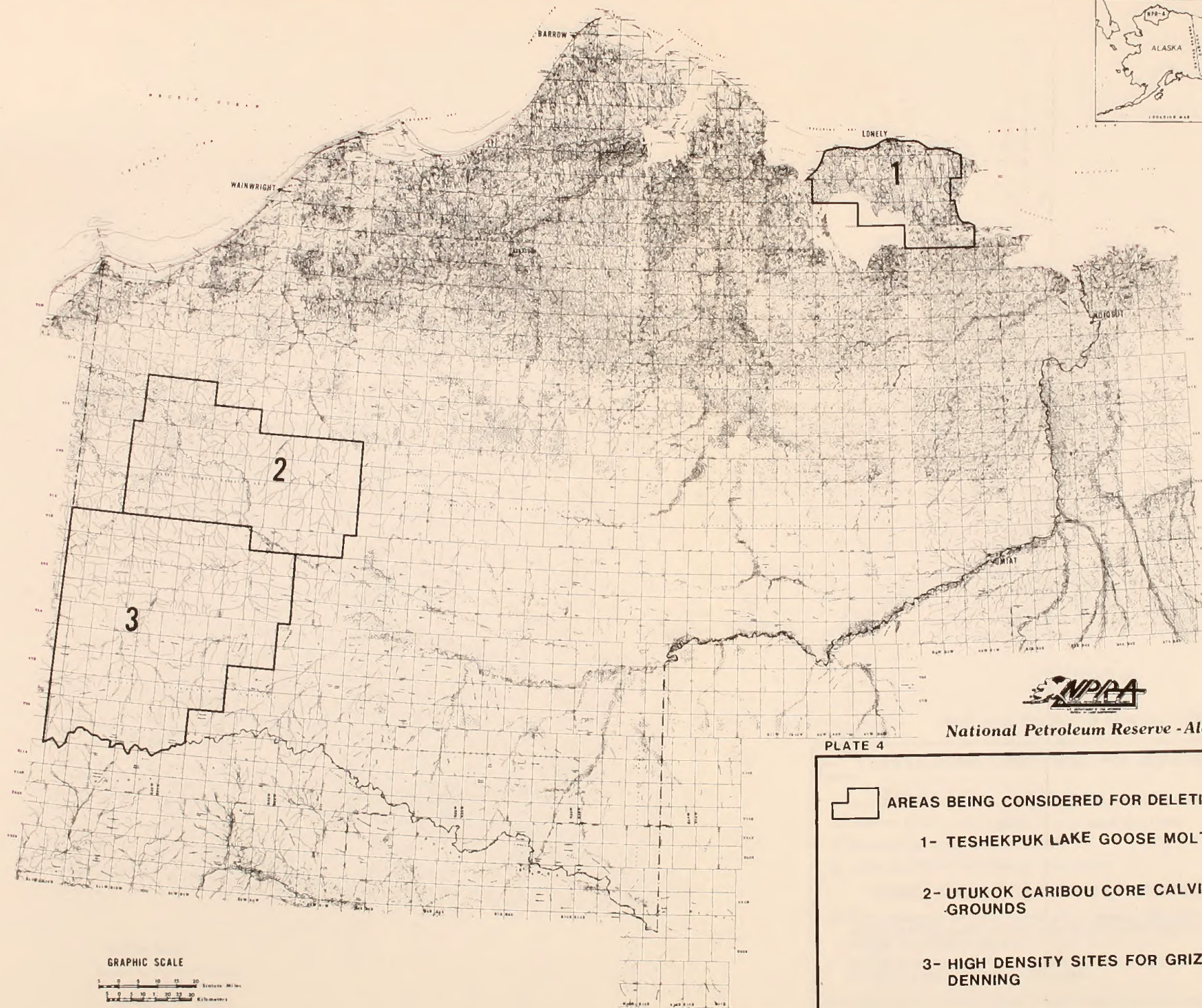
 **AREAS CONSIDERED FOR NO SURFACE
OCCUPANCY RESTRICTION**

NSO NUMBERS	HABITATS TO BE PROTECTED
1, 2, 3 AND 5	SHOREBIRDS, DUCKS AND GEESE
4	TESHEKPUK LAKE HERD CARIBOU RANGE
6 AND 7	PEREGRINE FALCON
8 AND 9	CARIBOU MIGRATION AND CALVING

GRAPHIC SCALE



Universal Transverse Mercator Projection



National Petroleum Reserve - Alaska

PLATE 4



AREAS BEING CONSIDERED FOR DELETION

1- TESHEKPUK LAKE GOOSE MOLTING

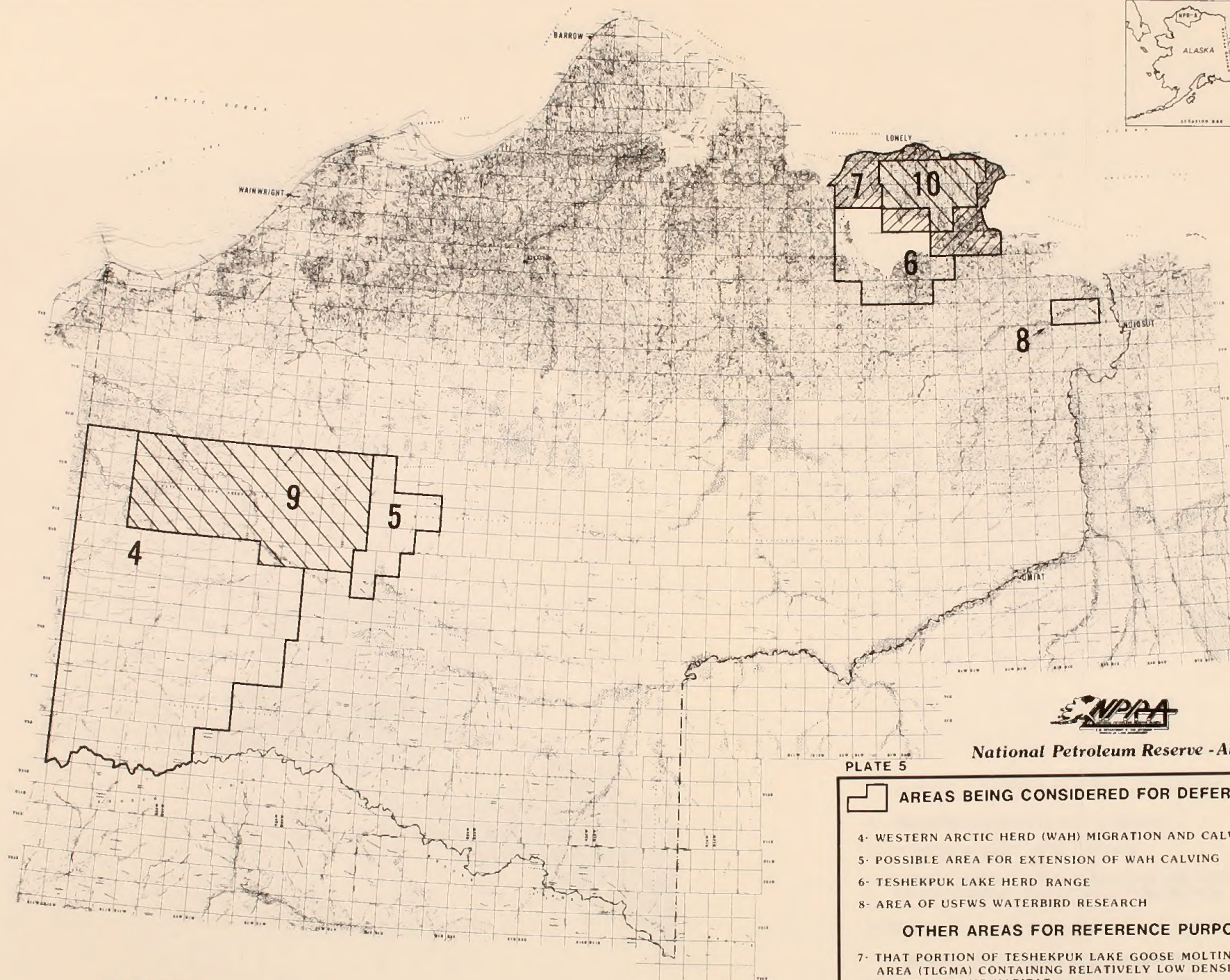
2- UTUKOK CARIBOU CORE CALVING
- GROUNDS

3- HIGH DENSITY SITES FOR GRIZZLY
DENNING

GRAPHIC SCALE



Universal Transverse Mercator Projection



National Petroleum Reserve - Alaska

PLATE 5

AREAS BEING CONSIDERED FOR DEFERRAL

- 4- WESTERN ARCTIC HERD (WAH) MIGRATION AND CALVING
- 5- POSSIBLE AREA FOR EXTENSION OF WAH CALVING
- 6- TESHEKPUK LAKE HERD RANGE
- 8- AREA OF USFWS WATERBIRD RESEARCH

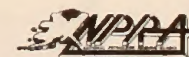
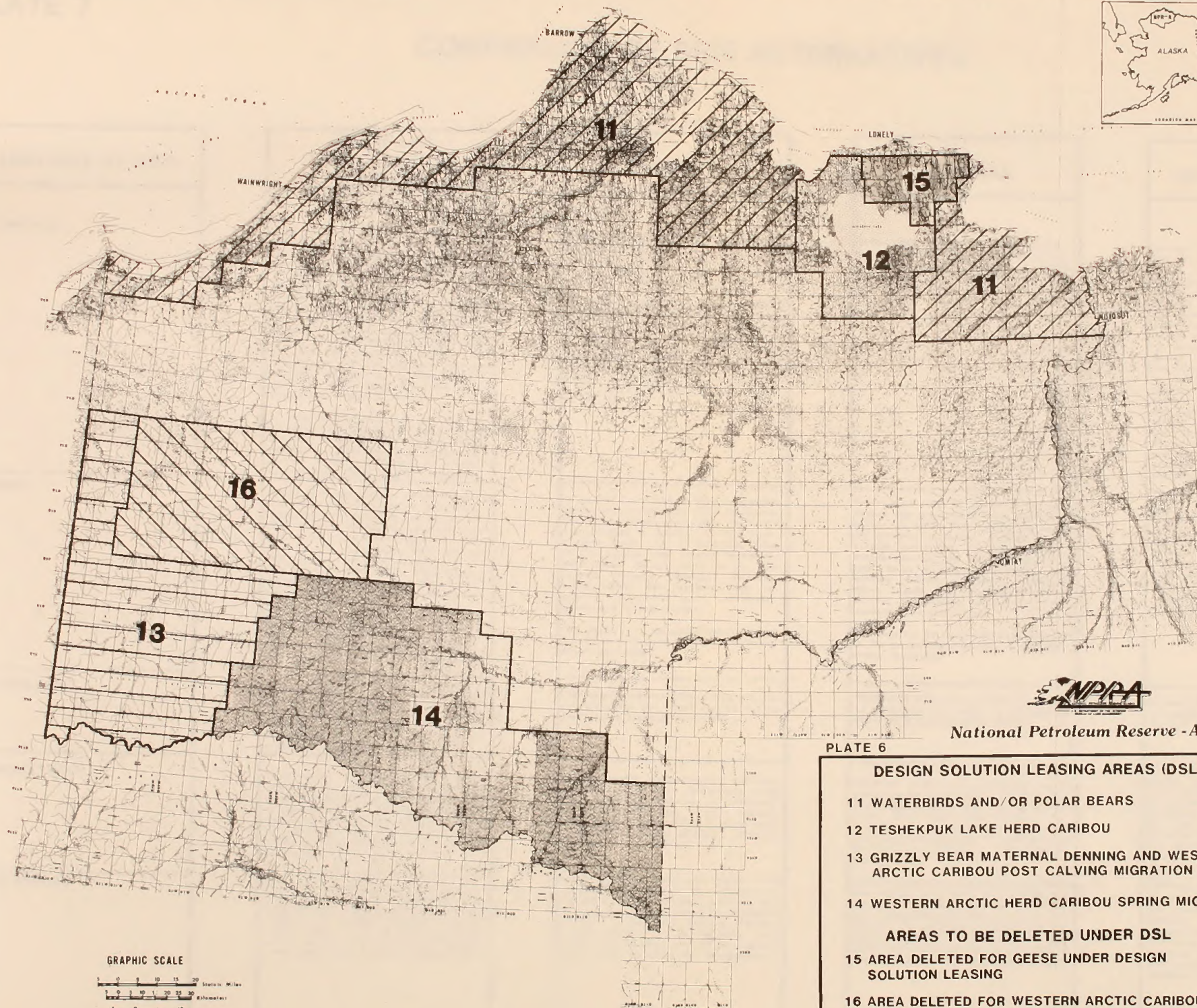
OTHER AREAS FOR REFERENCE PURPOSES

- 7- THAT PORTION OF TESHEKPUK LAKE GOOSE MOLTING AREA (TLGMA) CONTAINING RELATIVELY LOW DENSITY GOOSE MOLTING HABITAT
- 9- PORTION OF UTUKOK CORE CALVING AREA TO BE DELETED UNDER DEFERRAL LEASING
- 10- PORTION OF TLGMA TO BE DELETED UNDER DEFERRAL LEASING

GRAPHIC SCALE



Universal Transverse Mercator Projection



National Petroleum Reserve - Alaska

PLATE 6

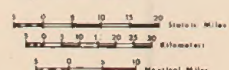
DESIGN SOLUTION LEASING AREAS (DSL)

- 11 WATERBIRDS AND/OR POLAR BEARS
- 12 TESHEKPUK LAKE HERD CARIBOU
- 13 GRIZZLY BEAR MATERNAL DENNING AND WESTERN ARCTIC CARIBOU POST CALVING MIGRATION
- 14 WESTERN ARCTIC HERD CARIBOU SPRING MIGRATION

AREAS TO BE DELETED UNDER DSL

- 15 AREA DELETED FOR GEESE UNDER DESIGN SOLUTION LEASING
- 16 AREA DELETED FOR WESTERN ARCTIC CARIBOU UNDER DESIGN SOLUTION LEASING

GRAPHIC SCALE



Universal Transverse Mercator Projection

COMPARISON OF DEIS ALTERNATIVES

RESOURCE AT RISK	STANDARD REQUIREMENTS LEASING	DELETION	DEFERRAL	DESIGN SOLUTIONS
CARIBOU	<p>Impacts on caribou would result from any permanent development within the NPR-A. Whether these impacts would be significant or even measurable in terms of population size or distribution depends heavily on where development occurs and at what intensity. Standard protections would probably be sufficient on most of the Reserve to mitigate impacts. The site-specific solutions making up these standard mitigations may fail to adequately address and conserve a regional resource such as caribou, especially if developments occur in the calving areas or block traditional migration routes.</p> <p>If leasing and development are allowed throughout the Reserve and are mitigated by only standard protections, then population reductions, fragmentation of present herds and changes in present distribution are highly probable.</p>	<p>Deletion of the majority of the central caribou calving areas for NPR-A's two herds would protect the habitats critical to maintenance of current and future sustainable population levels.</p> <p>Noticeable alteration of distribution and measurable reductions in populations remain probable. However, protection of the calving areas would provide at least the opportunity for caribou populations to recover from any significant impacts occurring in northwestern Alaska, assuming some final habituation to the human activities of development if possible.</p>	<p>Recommended deferrals would provide caribou with additional short-term protections until patterns of NPR-A developments are established and their impacts are quantifiable.</p>	<p>Design solutions regarding caribou stress the use of site-specific solutions to the currently identified regional impacts stemming from development. Proposed stipulations for the leasing or permitting process require the Lessee/permittee to design facilities and activities to minimize conflicts with traditional caribou use and to assess the effectiveness of their design before applying for a permit. Use of design solutions is not expected to eliminate all predicted impacts on caribou. However, effective use of design solutions and an implication that costly redesign may be required should the effectiveness assessment of the applicant prove incorrect will elicit the best designs and reduce the possibility of cumulative impacts stemming from the standardizations of ineffective mitigation.</p>
GEESE	<p>Should development occur in the Teshekpuk Lake Goose Molting Area, a measurable reduction in the world population of black brant is predicted. White-fronted and Canada geese would experience the same loss of disturbance free molting habitat that lead to measurable population reductions but unlike black brant, their losses are not expected to be significant to total populations.</p> <p>If intensive developments are allowed within the coastal no surface occupancy zones recommended for protection of goose and other waterbird use, measurable losses of populations are predicted.</p>	<p>Geese would still be exposed to periodic stress and potentially fatal increased energy use unless enforceable regulations are provided to control aircraft overflights bound for, or departing from fields outside the deleted Teshekpuk Lake Goose Molting Area during the molting season. However, deletion would insure that isolated loss of molting individuals would not become measurable in populations.</p> <p>The impacts of intensive developments in the no surface occupancy areas would remain unchanged.</p>	<p>Geese would still be exposed to periodic stress and potentially fatal increased energy use unless enforceable regulations are provided to control aircraft overflights bound for, or departing from fields outside the deleted Teshekpuk Lake Goose Molting Area during the molting season. However, deletion would insure that isolated loss of molting individuals would not become measurable in populations.</p> <p>The impacts of intensive developments in the no surface occupancy areas would remain unchanged.</p>	<p>Design solutions regarding geese and other waterbirds stress that the Lessee or permittee seek out and use methods which reduce habitat and use disturbances. This may require no surface occupancy restrictions or BLM coordination with FAA to establish definite flight rules that limit summer low altitude overflights of nesting, molting and staging areas.</p>
PEREGRINE	<p>NPR-A developments may lead to increased public access to the recreational uses of the major rivers. Any increase in the frequency or duration of human disturbance at nest sites will lead to a decrease in nesting success.</p>	<p>Measurable reduction in nesting success of peregrine and other raptors due to recreation impacts would occur.</p>	<p>Measurable reduction in nesting success of peregrine and other raptors due to recreation impacts would occur.</p>	<p>Measurable reduction in nesting success of peregrine and other raptors due to recreation impacts would occur.</p>
GRIZZLY BEAR	<p>Developments in southern NPR-A would maximize the potential for human/bear conflicts in which the bear would have to be destroyed. Alteration of home ranges and denning areas in high density use areas combined with destruction of marauding bears would cause a measurable population loss.</p>	<p>Grizzly/bear confrontations and high density use habitat alterations would be substantially reduced. In addition, a protective enclave of high density use would be preserved as a recruitment area for grizzlies adversely affected elsewhere on the Arctic Slope.</p>	<p>Deferral rather than deletion would preserve all benefits to the grizzly bear population at least for the short-term. In addition, case studies available from areas adjacent to the deferred area would be available to more accurately assess the management options available in 1992.</p>	<p>Design solutions regarding grizzly bears stress the accurate identification of preferred habitats adjacent to permitted activities and preservation of and access to those habitats. Facility design, operational procedures and public safety programs would be planned to give bears and humans equal protections to limit destruction of bears.</p>
POLAR BEAR	<p>Some polar bear would be destroyed in response to worker/bear conflicts and some unquantifiable reduction in availability of maternal denning habitat would result. It is unlikely that these impacts would lead to any significant change in polar bear demographics.</p>	<p>Some polar bear would be destroyed in response to worker/bear conflicts and some unquantifiable reduction in availability of maternal denning habitat would result. It is unlikely that these impacts would lead to any significant change in polar bear demographics.</p>	<p>Some polar bear would be destroyed in response to worker/bear conflicts and some unquantifiable reduction in availability of maternal denning habitat would result. It is unlikely that these impacts would lead to any significant change in polar bear demographics.</p>	<p>No deletions or deferrals were suggested for polar bear protection because residual impacts were predicted as insignificant and unmeasurable. The design solution seeks to study the accuracy of this conclusion to insure that no permitted activity ever adds to possible cumulative significance.</p>

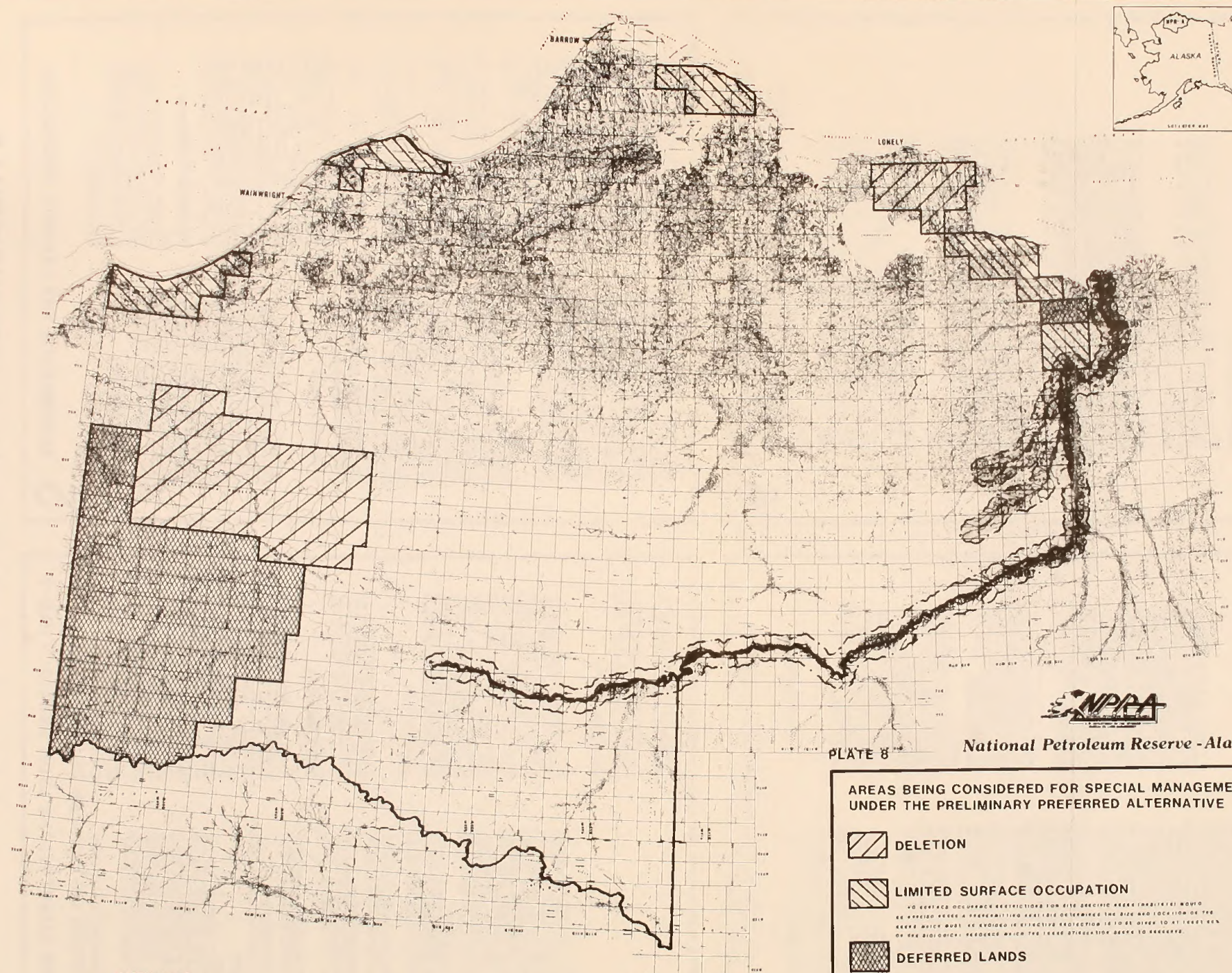



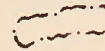


PLATE 8

National Petroleum Reserve - Alaska

AREAS BEING CONSIDERED FOR SPECIAL MANAGEMENT UNDER THE PRELIMINARY PREFERRED ALTERNATIVE

-  **DELETION**
-  **LIMITED SURFACE OCCUPATION**
NO SURFACE OCCUPANCY RESTRICTIONS FOR SITE SPECIFIC KEYS (INDUSTRIES) WOULD BE APPLIED UNLESS A PRELIMINARY ANALYSIS DETERMINES THE SIZE AND LOCATION OF THE KEYS WHICH MUST BE AVOIDED IF EFFECTIVE PROTECTION IS TO BE GIVEN TO AT LEAST ONE OF THE BIOLOGICAL RESOURCES WHICH THE THESE STRATEGIC KEYS TO RESOURCES.
-  **DEFERRED LANDS**
-  **RAPTOR NESTING SITE SPECIAL MANAGEMENT ZONES**



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1 LEASE STIPULATIONS FROM PREVIOUS NPR-A SALES OR ADOPTED DURING SCOPING

Lease stipulations used at first or second sale

Microbiotics

All activities and structures of the Coastal Plain and shoreline of NPR-A will be designed to avoid or minimize any adverse effects on microbiotic life. The applicant for any NPR-A lease will be required to submit a microbiotic impact statement. The applicant for any NPR-A lease will be required to submit a microbiotic impact statement. The applicant for any NPR-A lease will be required to submit a microbiotic impact statement.

Biological Factors

Exploration, drilling and other development activities will be conducted as follows in order to protect their nesting sites:

- All construction and ground level activity will be completed by April 15 through August 31.
- Alcitrator shall maintain 1000' altitude above nest sites and one mile horizontal distance from nest sites from April 15 - August 31.
- Proposed drill pads, permanent structures, construction equipment, and other structures will be sited within one mile of any nesting site.
- Blasting or other significant construction noise within one mile of any nesting site will be prohibited.
- Material removal sites, disposal sites, water resources, drill pads, or other structures will be sited within one mile of any nesting site.

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- Material removal sites, disposal sites, water resources, drill pads, or other structures will be sited within one mile of any nesting site.

3

OTHER STIPULATIONS BY SOURCE

Shallow Water Drilling (V)

Exploration (See Federal Land Management Policy)

After completion of exploratory drilling, all structures will be removed from the leasehold. The lease will be relinquished to the BLM. The lease will be relinquished to the BLM. The lease will be relinquished to the BLM.

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- Material removal sites, disposal sites, water resources, drill pads, or other structures will be sited within one mile of any nesting site.

2 SUBSISTENCE AND CARIBOU PROTECTION

Subsistence Fisheries

(Used at Previous NPR-A Sales)

No activities, construction, or facilities will be authorized within 200 meters of streams or lakes which support a subsistence fishery. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

General Subsistence Lease Stipulations

(Used at Previous NPR-A Sales)

The DPM, District Field Operations, Alaska Region, will conduct a field examination of the lease area to determine the presence of subsistence resources. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

- All construction and ground level activity will be completed by April 15 through August 31.
- Alcitrator shall maintain 1000' altitude above nest sites and one mile horizontal distance from nest sites from April 15 - August 31.
- Proposed drill pads, permanent structures, construction equipment, and other structures will be sited within one mile of any nesting site.
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- Material removal sites, disposal sites, water resources, drill pads, or other structures will be sited within one mile of any nesting site.

Exploration, drilling and other development activities will be conducted as follows in order to protect their nesting sites:

4

SITE SPECIFIC PERMIT STIPULATIONS OF BLM'S FAIRBANKS DISTRICT OFFICE

Land

Winter road or trail construction and use. Installing heavy equipment, is to be avoided. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

Camp

Construction of camp or other structures will be avoided. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

Trails

Exploration activities will employ low ground pressure vehicles of the BLM, Alaska Region, Fairbanks District Office. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

Operations Affecting Wildlife

All operations shall be conducted in ways which minimize damage to or disturbance of wildlife resources. The applicant for any NPR-A lease will be required to submit a subsistence impact statement.

- All construction and ground level activity will be completed by April 15 through August 31.
- Alcitrator shall maintain 1000' altitude above nest sites and one mile horizontal distance from nest sites from April 15 - August 31.
- Proposed drill pads, permanent structures, construction equipment, and other structures will be sited within one mile of any nesting site.
- Blasting or other significant construction noise within one mile of any nesting site will be prohibited.
- Material removal sites, disposal sites, water resources, drill pads, or other structures will be sited within one mile of any nesting site.

PLATE 10 SYNTHESIS OF COMMENTS RECEIVED DURING SCOPING

Commentors	Caribou	Moose	Musk Ox	Polar Bear	Raptors/Specially Peregrine Falcon	Fisheries	Fox	Wolverine	Wolves	Grizzly Bear	Dall Sheep	Waterbirds
State of Alaska Governmental Coordination Unit	★▲□	★	☼			★▲						
Elders/leaders of Wainwright and Atkasook	★▲					★▲						
Elders/leaders of Barrow and the Western Arctic Regional Subsistence Council State of Alaska	★▲					★▲						
Department of Fish and Game	★▲□											★▲□
U.S. Fish & Wildlife Service	★▲□				★▲□							
National Wildlife Federation	★▲□				★▲□		★	★▲	★▲	★▲	★▲	★▲□
Northern Alaska Environmental Center	★▲□			★	★▲□	★▲□		★▲	★▲	★▲	★▲	★▲□
Tanana Chief Conference, Inc.	★▲											
D.W. Mitchell	☐											
Exxon	☐											
Amy Klar					★▲□							
Mary Gore					★▲□							
Bob Dittreck					★▲□							
Clayton White					★▲□							
Alaska Center For the Environment				★	★▲□	★▲						★▲□
<p>★ Important and controversial existing NPR-A Resource, Resource use, feature or area which the commentors asserted must be comprehensively addressed in the DEIS.</p> <p>▲ Resources or Resource uses which the commentor asserted were very sensitive to oil and gas activities where innovative mitigations and effective restrictions on disturbance must be identified in the DEIS.</p> <p>□ Resources which the commentors asserted were very vulnerable to oil and gas development because the species concentrates in high densities in restricted habitats or a seasonal basis.</p> <p>☼ Potential conflicts if reintroduced.</p> <p>☐ No reputable data exists, in the view of these commentors, to support a conclusion that these resources would be adversely affected by oil activities.</p>												
Commentors	Subsistence Use of NPR-A	As Moose/Raptor Habitats And as a Scenic/Recreational Resource	Colville River	Habitats	Ukukok Core Caribou Calving Area	Barrier Islands and Other Coastal/ Waterbird/Shorebird Habitats	Freshwater Wetland Habitats Essential to Waterbird Feeding and Molting	Wolf, Wolverine and Bear Maternal Denning Habitat				
State of Alaska Governmental Coordination Unit	★▲	★▲	★▲		★▲	★▲	★▲					
Elders/leaders of Wainwright and Atkasook	★▲											
Elders/leaders of Barrow and the Western Arctic Regional Subsistence Council	★▲											
State of Alaska Department of Fish and Game	★▲				★▲	★▲	★▲					
U.S. Fish & Wildlife Service												
National Wildlife Federation			★▲		★▲	★▲	★▲					
Northern Alaska Environmental Center			★▲		★▲	★▲	★▲					
Tanana Chief Conference, Inc.	★▲											
D.W. Mitchell	☐											
Exxon	☐											
Amy Klar			★▲									
Mary Gore			★▲									
Bob Dittreck			★▲									
Clayton White			★▲									
Alaska Center For the Environment			★▲									

Bureau of Land Management
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Denver, CO 80225

BLM TO SYNTHESIS OF COMMENTS RECEIVED DURING SCOPING

Form 1279-3
(June 1984)

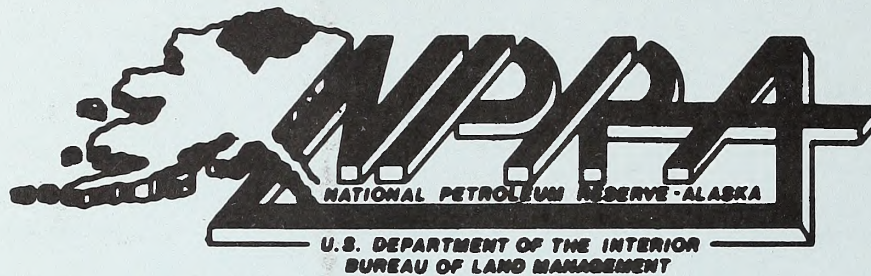
BORROWER

TD 195 .PA M37 1982

Draft environmental
statement on oil and

DATE LOANED	BORROWER

USDI - EIM



**For further information contact
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**Old Federal Building
Room 249
605 W. 4th Avenue
Anchorage, Alaska
Telephone: (907) 271-3632**

or by mail:

**United States Department of the Interior
Bureau of Land Management/NPR-A
Alaska State Office
701 C Street, Box 13
Anchorage, Alaska 99513**